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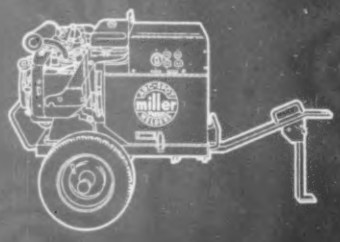
JULY, 1956



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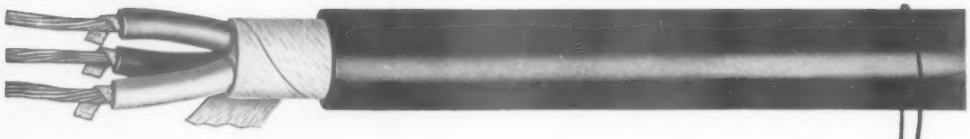

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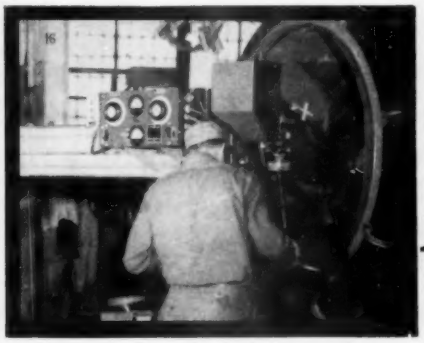

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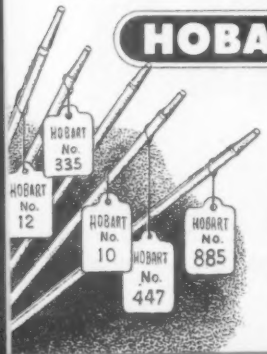

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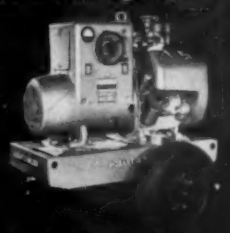

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Welding Engineer

JULY, 1956
VOL. 41—No. 7

THE MAGAZINE OF JOINING
AND SEVERING OF MATERIALS

America's pioneer publication which, combined with The Acetylene Journal, has been devoted to the interest of the welding and allied industries since 1898

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SUPERGOGGLES by Jackson

Truly a Cover-All Design

They're *wider* to allow plenty of inside room for good fit and free up and down movement where today's larger (never wider than $5\frac{11}{16}$") prescription and safety spectacles are worn.

They're also *deeper*, to clear the bridge of "horn-rimmed" glasses, somewhat deeper along the temples to afford greater side protection to the eyes, without being bulky.

This width and depth, added only where needed, gives an 18% greater, well ventilated inside area, making the Supergoggles also more comfortable, cooler to wear.

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Series '70'

For Gas Welding, Flame Cutting & Brazing, types W-70 and WR-70 have 50 mm. lenses, shades 3 thru 6. Baffle plates over vent screens exclude light, flying particles.

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Elastic Headband holds WR-70, GR-70.

Plastic Headrest holds types W-70 and G-70 more firmly. Extruded plastic, impregnable to moisture, holds its shape, is easy to sterilize. Positive locking adjustment has clearly marked hat sizes. Cork-padded sweatband is easy, inexpensive to replace. Adjustable springs, in telescopic arms, hold goggles gently against face.

Series '50' Goggles fit over narrow-frame prescription glasses and safety spectacles

Series '60' Unigoggles fit over the widest prescription and safety glasses now in use

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Sold World-Wide—through Distributors and Dealers

MODERN building of Capital Welding Supply Co., Little Rock, Ark., utilizes welded construction. New structure is brick with concrete foundation, structural steel supported. Office is air-conditioned and sales-display room incorporates latest in merchandising display.

FUTURE engineers are given closeup of engineering by Frederic O. Hess, president, Selas Corp. of America. Students are (left to right) Berna Merton, Jim Freund and Roger Mobley. (See story below.)

News

Lincoln Electric plans expansion

The Lincoln Electric Co., Cleveland, has begun expansion of its plant capacity for manufacture of arc welding machines and electrodes. Work is underway to complete $2,000,000 of the projected $8,000,000 expansion by the end of this year.

The expansion will provide 60% more manufacturing capacity. Extensions will be made to the present plant for new facilities and equipment. The entire project is scheduled for completion within the next three years.

The company is also constructing new plants to replace present facilities in France and Australia; an addition is also being constructed for its Canadian plant.

Aluminum mill for American Brass

Ground was broken June 6 for The American Brass Co.'s integrated aluminum mill in Terre Haute, Ind. The new fabricating facility will be an extension of The Anaconda Co.'s entry into the aluminum field. (American Brass is a wholly-owned subsidiary of Anaconda.)

An aluminum reduction plant at Columbia Falls, Mont., was brought on line last year (*see* WELDING ENGINEER, *Oct., 1955, p. 6*). The Montana plant has an annual capacity of 60,000 tons of ingot aluminum. It will be a source of supply for the Terre Haute mill.

The new mill, including separate buildings for offices and a research laboratory, will cover more than 500,000 sq ft. Estimated cost of construction: more than $25,000,000. Production is expected to start by the third quarter of 1957.

James F. Ackerman, formerly vice-president of American's Torrington, Conn., Div., will be in charge of the new facility.

Crucible opens first Texas sales office

Its first sales office and warehouse in Texas was opened June 9 by Crucible Steel Co. of America. The city: Dallas.

Approximately 400 Texas industrialists and businessmen were present at the opening of the new building at 7901 Sovereign Row in the Brook Hollow industrial district. The Dallas warehouse will carry a complete stock of the firm's stainless, alloy, tool and high-speed steels and will serve the northeast Texas area.

Crucible owns additional property in the area—thus providing for future expansion. William R. Cummings is in charge of the new installation.

More engineers is aim of Selas Corp.

To encourage future engineers and to help remedy the acute shortage of engineers, the Selas Corp. of America, Dresher, Pa., has initiated a program of action.

Convinced that lack of science curricula at the high school level is a prime cause of the engineering shortage, Selas Corp. recently presented the beginning volumes of what will be an up-to-date engineering reference library for the Upper Dublin Township high school, Ft. Washington, Pa. In addition, groups of the high school science students periodically tour the Selas plant, to observe engineers at work.

Presenting the textbooks at a general assembly of the student body of Upper Dublin high school, Frederic O. Hess, president of Selas Corp., pointed up the need for adequate curricula for the training of not only future engineers but for other scientific training as well.

(For another solution to the acute engineering shortage see editorials, WELDING ENGINEER, *April and May.)*

Organize cylinder leasing firm

Liberty Leasing Corp. has been formed in New York City. At the outset it will engage in the leasing of high pressure and acetylene cylinders.

President of the new firm is M. I. Behrens, Jr., former president of the Ludwig Baumann & Spears, New York City furniture chain. George G. Weiss is vice-president. Offices of the new firm are at 341 Madison Ave., New York City.

PRESENT at opening of Santa Clara welding show are, from left: Sam Cohn Jr., Victor Equipment Co.; Ray Townsend, Tweco Products; Dr. Joseph Smith, San Jose State College; George Starbird, Mayor of San Jose; E. A. Daniels, Victor Equipment Co. (See WELDING ENGINEER, June, p. 82.)

INCREASED office and manufacturing space is provided by new, modern air-conditioned building. The structure promotes efficiency by consolidating all operations at one location. (See story below.)

Gary (Ind.) Steel Works marks 50th anniversary

The world's largest integrated steel mill, U. S. Steel Corp.'s Gary Works, was thrown open to the public June 12 and 13 in commemoration of its half-century of operations. Within this 50-year span, the Gary, Ind., facility has produced more than 171,000,000 tons of steel—more than any other steel plant in the world.

The city of Gary is celebrating its golden anniversary in conjunction with the U. S. Steel plant.

Oxo Welding, Universal occupy new plant

Oxo Welding Equipment Co., manufacturing division, and Universal Welding Supply Co., have moved into a new plant located at Cedar and Oak Sts. in New Lenox, Ill. Formerly located in Chicago, the move consolidates operations at the new location where a branch had been maintained. John Matasovic is a partner in the business with his wife.

Welding exposition at Utah State

A welding engineering exposition will be held July 12, 13 and 14 at Utah State Agricultural College. The program will include a steak fry and party for early arrivals on July 12.

The program for Thursday and Friday will include a kick-off symposium discussing the meaning of welding for America, a symposium on recent developments in metallurgy of ferrous welding, general applications of resistance welding machinery, and a round table on the weldor and his problems.

An application symposium will be held Saturday to discuss carbon dioxide and its future uses in inert arc welding, welding and brazing aluminum alloys, modern manpower management. The exposition will conclude with a tour of laboratories.

Jackson Welding in new building

Jackson Welding Supply Co., Inc., has moved to quarters in a new, modern building. The new address of this welding supplier is 535 Buffalo Rd., Rochester, N. Y. Robert G. Jackson is president.

NWSA makes index system available to non-members

Its Tab-Index System has been made available by the National Welding Supply Association to all distributors and manufacturers of welding equipment and accessories. Up to now, it has been restricted to association members.

(For the second year in succession, WELDING ENGINEER's *Fact File Issue, published in Mid-June, has listed its product classifications to conform with the Tab-Index System.)*

The indexing procedure was introduced to NWSA members after extensive research by the catalog committee. More than 1,400 sets are said to be now in use. (For more on Tab-Index, see *new products* in this issue.)

Gas Appliance Service moves to new plant

Gas Appliance Service, Inc., Chicago, has moved to new modern quarters at 1940 Balmoral Ave., in that city. The move provides an increase in office and manufacturing space.

New quarters include air-conditioned offices, improved material handling equipment, with ample parking space on the premises. The move consolidates all departments at one location. Gas Appliance Service designs and manufactures gas-fired production machines for flame hardening, annealing, brazing, soldering.

Hoeganaes Iron plans expansion

Plans for an expansion program are underway by Hoeganaes Sponge Iron Corp., Riverton, N. J., manufacturer. The firm manufactures metal powders for powder metallurgy, cutting and scarfing, chemical and plastics industries, atomic energy, and for iron coatings for welding electrodes.

Name steel man Marston Medal winner

The Marston Medal for 1956 has been awarded to James O. Jackson, vice-president and director of Pittsburgh-Des Moines Steel Co. The medal is awarded annually by Iowa State College, Ames, to an outstanding engineering alumnus.

Award was made on the basis of the contributions by Mr. Jackson to

Continued on page 96

compound Pressure®

the new and better cylinder manifold...

only the bushing turns

threads do it

a very tight seat results

a simple wrench does the job

The new compound pressure* cylinder manifold is made of the sturdiest die forgings and extruded rods; all are drilled for uniform inner dimension. The leak proof joint which results from the compound pressure design is tighter and more leakproof even than the well understood and long used connection between regulator and cylinder valve. The big improvement of this new invention lies in these facts: you can have any competent mechanic assemble a cylinder manifold to your own or our specifications with the assurance of absolute alignment and permanent leak proofness. Yet, the resulting cylinder manifold may be disassembled at any time, stored or moved and reassembled when required. It may be extended when needed, redesigned when desired, stored in bins as individual fittings. Only the bushings move in assembly, thus absolute alignment is certain.

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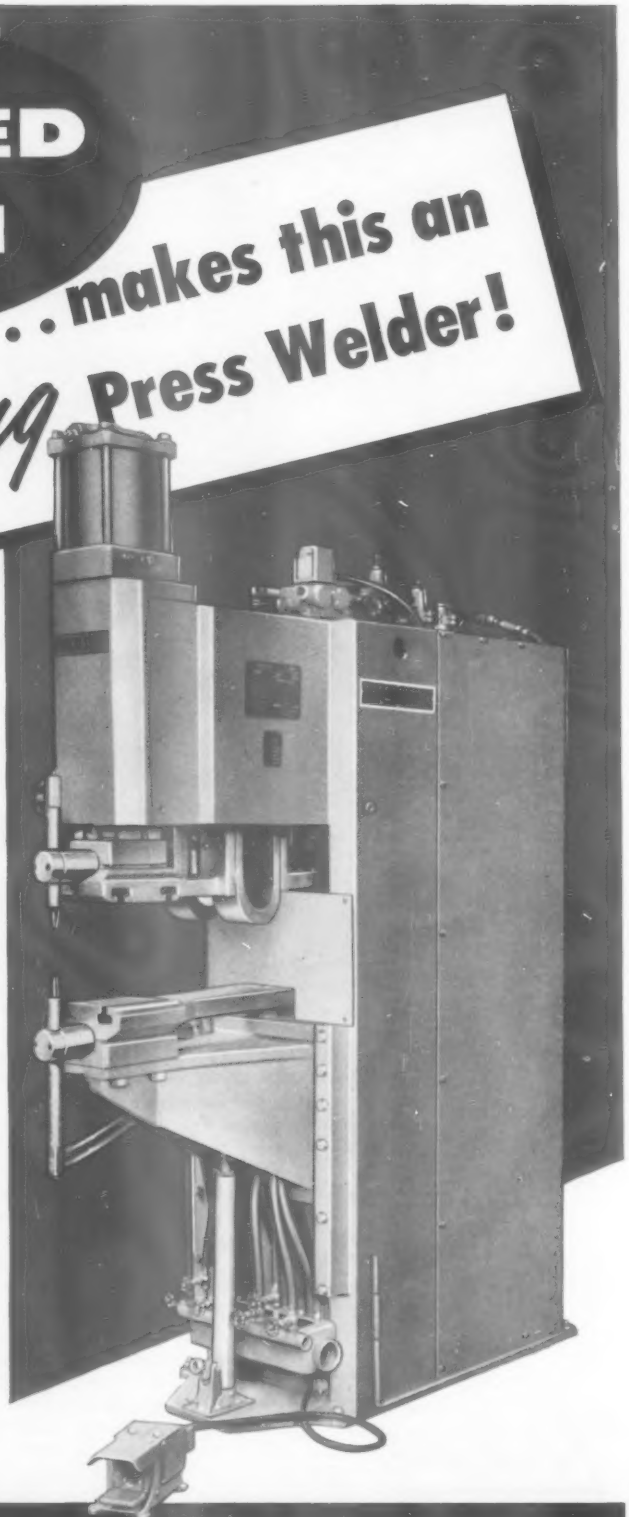

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JULY
1956

Your

Weld World

at press time

Last minute news of interest to those engaged in joining and severing materials.

. . General U. S. prosperity trend is mirrored in recent Census Bureau report which showed that per capita 1955 income of the average male worker was up to $3,400—a new record. Average income of women remained the same—$1,100.

. . U. S. population is now over 167,000,000—meaning even greater demands for welded goods and services in years to come.

. . Steel strike or not, price of steel will go up $8 to $10 per ton along with 15c or more an hour in wage increases for steel workers.

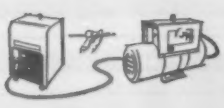
. . Auto production, according to Henry Ford II, will remain down "at least until the last quarter of 1956." Timing of the auto slump is fortunate in that other record breaking industries (construction, iron and steel, chemicals, etc.) are in a good position to hold the line.

. . Pipeline construction is continuing at the record pace set last year. Canada is now set to start what may prove to be the largest and most expensive project—a gas line from prairie provinces to Montreal. Cost: $375 million. Use of U. S. pipe and contractors most likely.

. . The Lincoln Electric Co. of Cleveland, Ohio, has announced an $8 million expansion to plant capacity for manufacturing arc welding machines and electrodes. (See page 5 for details.)

. . How long can copper prices stay high? Nobody seems to know what's holding them up. No break was seen in the domestic market at press time, despite the fact that London copper futures were down to less than 37¢ per lb a few weeks ago. The price started plummeting not long after setting a record high of 55½¢ per lb last March. Observers say prices in the U. S. (still 46¢ at this writing) will have to come down. Everyone seems to be living off inventories; at any rate, little buying is being done.

. . Demand for railroad equipment—welded freight cars—is climbing. Since this industry is not troubled by inventories, business is booming.



. . Infrared lights are becoming increasingly popular for preheating and postheating of weld areas. They are said to be less costly and cleaner.

. . Navy Department's Bureau of Ships is preparing a qualified products list for arc welding machines. Companies producing d-c variable voltage machines meeting requirements of BuShips Specification MIL-W-19285 can contact the Chief of BuShips Purchase Specifications and Standards Branch, Navy Dept., Washington 25, D. C. Products will be treated for consideration in awarding future contracts.

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STANDARD?

You name it—We have it

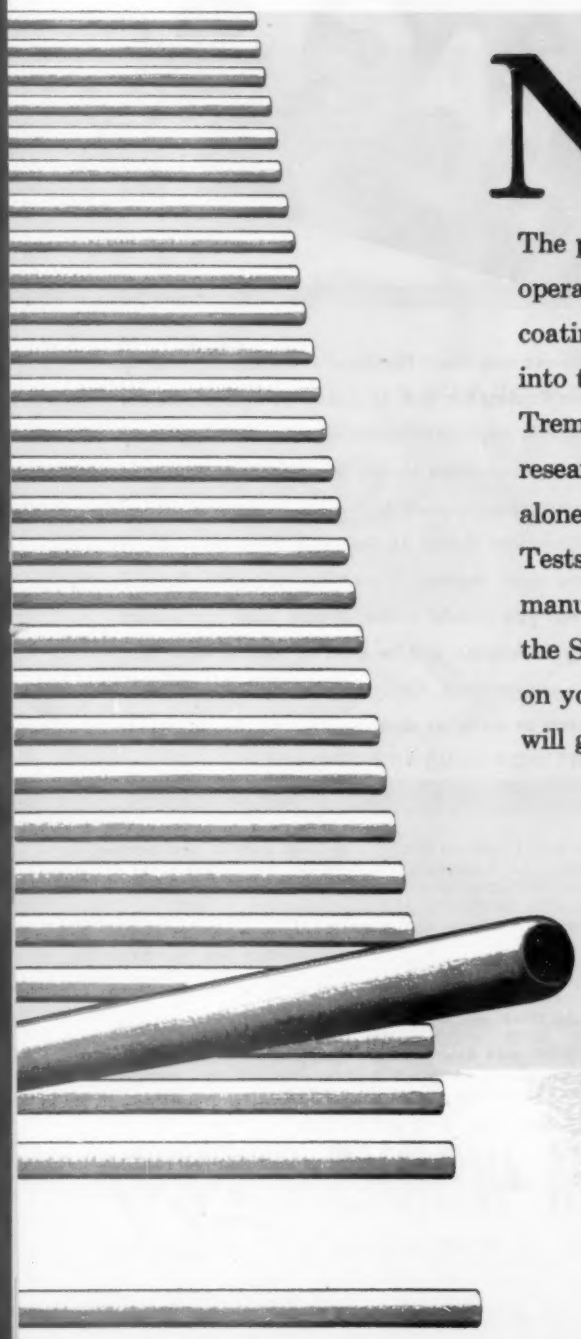
Typical of these are famous "CE" with little spatter, deep penetration; "B" for high quality radiographically sound welds in all positions; "C" for exceptional ease of handling in light fabrication.

SPECIAL?

You tell the need—
We'll show you the rod

For example here are three that have gained tremendous preference. "SP" for light structural work. Especially for poor fit-up and joints sealed with red or white lead or paint. "FS" with spray type transfer for high speed welding on light gauge auto and truck bodies. "LG" for use on frame sections.

or SPECIAL BETTER rods at



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2 GREAT NEW SILVER BRAZING FLUXES...

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Four standard APW formulae (APW1100, APW-1200, Deoxo and Black Flux) are available to simplify selective fluxing for you, to insure complete efficient protection in any classification of silver brazing. They enable the technician to key the selection of flux to the precise requirements of the job in production.

A "Complete Guide To Selective Fluxing" will be sent you upon request. It contains complete, factual data that you should know. If you wish, an expert Silvaloy Technician will be glad to consult with you, at your convenience. Call the Silvaloy Distributor in your area or write us directly. ★ ★ ★ ★ ★ ★

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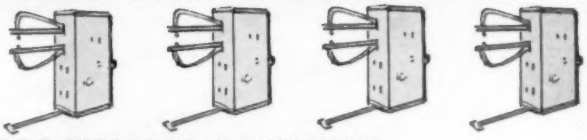
This you can count on...

INDUSTRIAL GASES

GAS WELDING EQUIPMENT

BURDOX will supply the right...

ARC WELDING EQUIPMENT



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equipment to do the job

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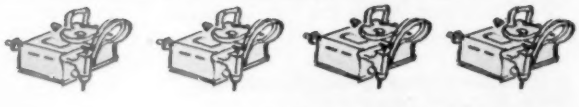

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ACCESSORIES

BURDOX offers you *this distinct advantage* — the best and lowest cost way of doing your welding and cutting jobs . . . because BURDOX gives you the choice of ALL the *different* methods of doing the job. Our only reason for recommending one process over another is that it will do your work better! You'll save time, money and trouble by checking your welding and cutting needs *first* with BURDOX. Catalog available on request.

THE BURDETT OXYGEN CO.

3300 Lakeside Avenue • Cleveland 14, Ohio

PLANTS: Cleveland, Dayton, Findlay, Mansfield, Youngstown; Ohio and Los Angeles, California

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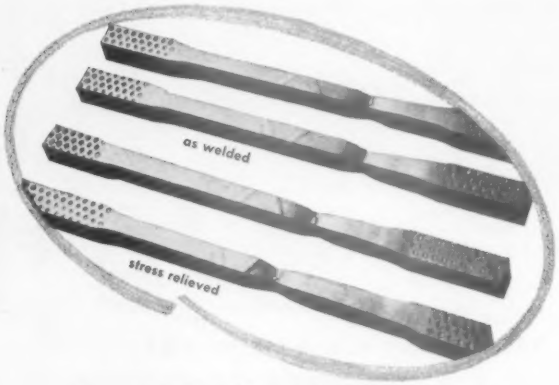
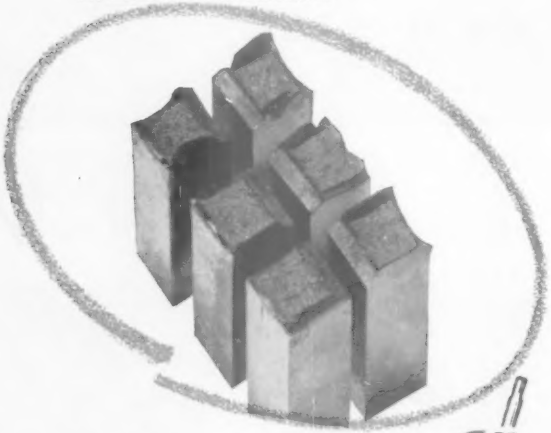
NEW ATOM-ARC 'T'

IRON POWDER LOW HYDROGEN ELECTRODES

for welding Carilloy "T1" Steel



Transverse tensile test bars welded with Atom • Arc "T" electrodes. Notice that all breaks occurred in the base metal.



Notice the ductile fracture in these all weld metal Charpy V notch impact bars broken at —65° F.

Here's the answer to dependable, economical high strength welds on Carilloy "T1" Steel

100% Joint Efficiency

Developed especially for the welding of "T-1" steel, the outstanding physical properties of Atom • Arc "T" provide 100% joint efficiency in the "as welded" or "stress relieved" condition.

Excellent Ductility

Ductility and impact values are excellent at low temperatures. Charpy V notch impact values of 29 ft. pounds at —65° F. "as welded", 23 ft. pounds at —65° F. "stress relieved". All breaks under impact show excellent ductility.

Plus

Atom • Arc "T" offers these outstanding plus values for which every Atom • Arc electrode is widely known . . .

X-Ray quality crack-free welds
Easy operation
Faster deposition rates
Low spatter loss—quick, easy clean-up
Smooth uniform weld beads in all positions.

Free Data Sheet

Write today for complete information on welding Carilloy "T-1" steel with Atom • Arc "T" electrodes.

Alloy Rods Co.

General Offices and Plant—Lincoln Highway West
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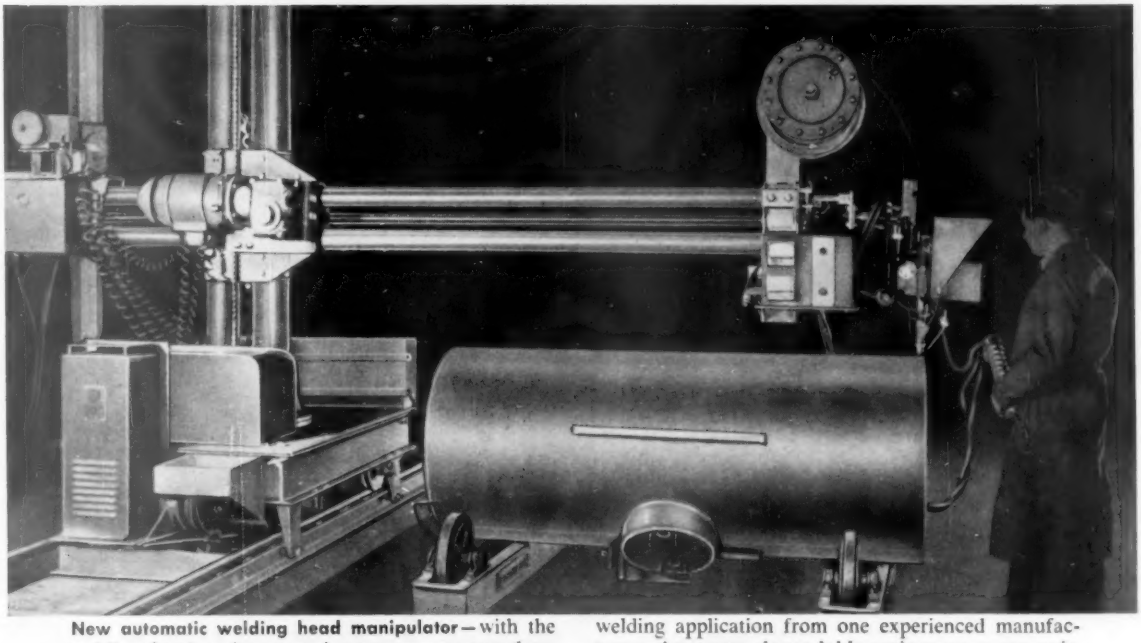
no finer electrodes made . . . anywhere

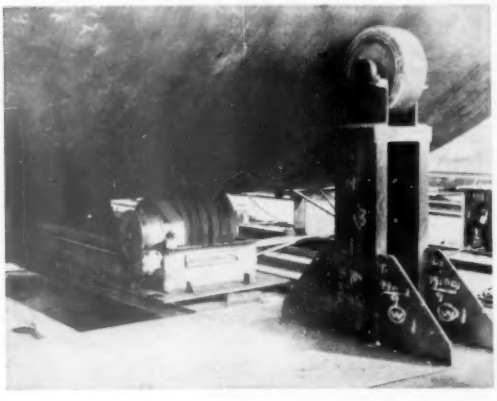
NOTE: Carilloy "T-1" is a registered trademark of the United States Steel Corporation.

Automatic welding made easy!

Now—only Worthington offers complete basic equipment line—plus nationwide sales and service



New automatic welding head manipulator—with the welding head and accessories you want—completes Worthington's welding equipment line. You can get all the basic equipment you need for every automatic welding application from one experienced manufacturer. Accurate, dependable ratings on every unit. Choose from the largest standard equipment line on the market.



Automatic turning rolls permit you to rotate cylindrical work for welding and assembly simply by pushing a button.

New power elevation is standard on four Worthington welding positioners. Now tilt, rotation and lift are all automatic. And at Worthington you get the equipment and service you need—when you need it.

Write for details to Worthington Corporation, Positioning Equipment Division, Section Y.6.2, Harrison, New Jersey.

Y.6.2

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Welding Positioners • Turning Rolls • Manipulators

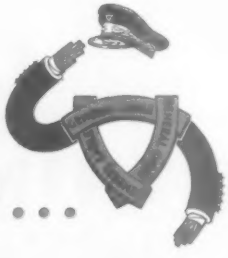
Aluminum Welding Cable

Makes Your Job Easier!

Saves Effort!

Lighter weight and superior flexibility lets you weld faster and easier on every job . . . less operator fatigue!

Type D-866 *Aluminum* Welding Cable is available in all standard sizes from General Cable.



General Cable . . . *at your service!*

GENERAL CABLE CORPORATION, 420 Lexington Avenue, New York 17, N.Y. Offices and Distribution Centers Coast-to-Coast

Fire cracks cast iron flywheel... Ni-Rod "55" repairs 2800-lb. casting

Saves $30,000-$60,000 in downtime loss

Flames leaped up from the transmission belt of this cast iron flywheel early one Sunday morning.

Firemen went to work quickly and cold water from their fire hoses hit a flywheel section and cracked it in two places. The owner was in *hot* water!

The wheel is part of a Corliss steam-engine at Wickwire rod mill, Cortland, N. Y. — the *only* available source of power for 14 roughing and finishing stands of their rod mill.

The damaged casting couldn't be replaced in less than 30 to 60 days. Meanwhile, downtime costs would mount — at the rate of $1,000 a day!

Welding could prevent these losses. But would welds hold firmly as the 2,300-lb. segment spun through space *at more than 60 mph?*

With easy-handling Ni-Rod "55"* electrodes, company weldors produced the *extra* strong welds required — and completed the repair in less than 1 day!

Strong, sound welds. Weekly tests—including dye checks and flame checks — were continued for almost a year. Showed not a sign of a crack. *More* proof: A new casting intended to replace the one repaired with Ni-Rod "55" was delivered five months later. The repaired casting has held up so well, thanks to Ni-Rod "55" electrodes, that Wickwire has not had to install the replacement!

Even heavy sections of cast iron such as this flywheel, can be welded quickly and easily with Ni-Rod "55" electrodes because of its nickel-iron core wire and *special* flux coating.

Want more information about successful cast iron welding? Our new illustrated booklet gives tips on preparation, welding technique, getting maximum machinability, and more. "A Handy Guide to Welding Cast Irons" is yours on request. *Registered Trademark

The International Nickel Company, Inc.
67 Wall Street New York 5, N. Y.

INCO TRADE MARK **Welding Products**

Electrodes
Wires
Fluxes

SAVE 28% ON WELDING

Exchange your used tubes for G-E Remanufactured Ignitrons! These carry a new-tube warranty!

Depending on tube size, you will save from $17.90 to $63 a tube by replacing with General Electric remanufactured ignitrons. The method is simple. As G-E ignitrons near or reach the end of life, deliver them—if in exchangeable condition—to your G-E tube distributor. Tube for tube, he will supply you with G-E remanufactured ignitrons at savings of nearly one third over new tubes.

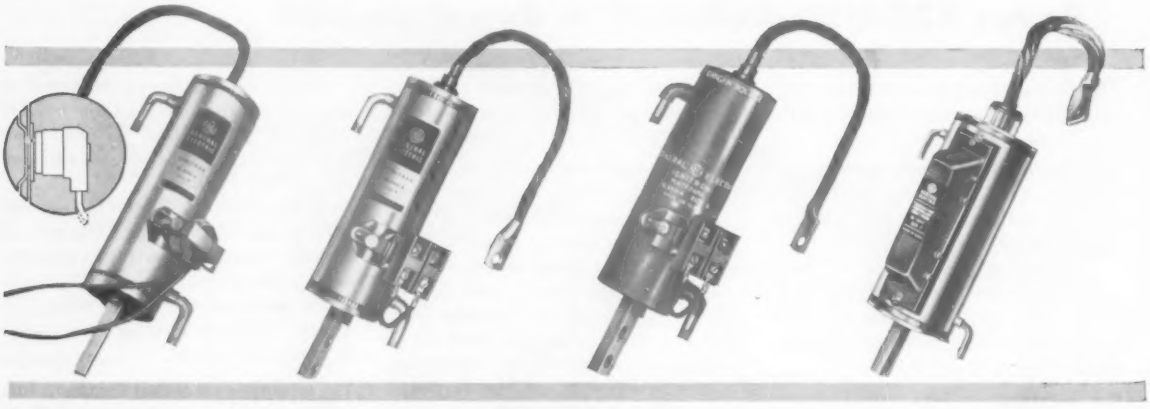
You are buying the same long life and reliability that new ignitrons offer, since G-E remanufactured tubes carry the full standard ignitron warranty, and are factory-tested to new-tube specifications. A complete rebuilding job by General Electric makes this high quality possible. See illustration at right for the new G-E parts which are supplied in *all* cases, regardless of tube condition.

Annual cost reductions of many thousand dollars for plants using ignitrons in quantities—savings of hundreds of dollars for small users—come from G.E.'s remanufactured-ignitron exchange plan. Based on the number of tubes you have in operation, ask your G-E distributor to estimate how much *you* can save! *Tube Department, General Electric Co., Schenectady 5, N. Y.*

ALSO... your G-E distributor can fill every requirement for late-design ignitrons:

New-design, current-production General Electric welding ignitrons come equipped in many different ways, to meet your individual needs. See pictures and descriptions below. Sizes are given at right. Pinpoint your requirements from this group of advanced welding ignitrons—the industry's most extensive and widely useful!

CAPACITY	G-E CONVERTIBLE IGNITRON, WITH OR WITHOUT PLASTIC COATING	GENERAL ELECTRIC TEMPERATURE-CONTROLLED IGNITRON	REPLACES
40 amp	GL-5551-A	GL-6346	GL-5551/FG-271
140 amp	GL-5552-A	GL-6347	GL-5552/FG-235-A
355 amp	GL-5553-B	GL-6348	GL-5553-A



G-E Convertible Ignitron has built-in thermal-contact bracket (circle) that will carry a thermostat for over-temperature protection, or for water regulation. Thermostat shown here is equipped with flying leads.

Convertible Ignitron above has a terminal-block thermostat. Bracket mounting of thermostat permits the same ignitron to be used in standard or temperature-controlled applications. You save stocking two tubes.

General Electric Plastic-coated Convertible Ignitron has a safety plastic covering to shield workers from hazardous voltages. Plastic is red for warning. "Danger . . . voltage" is stamped on tube conspicuously.

G-E Temperature-controlled Ignitron is the finest tube of its kind. Over-temperature control . . . water regulation . . . both are built in. The tube is pre-adjusted at the factory for lifelong efficiency of operation.

IGNITRONS!

ALL-NEW CATHODE ASSEMBLY

Every General Electric remanufactured ignitron gets a complete new cathode assembly. Cathode parts are the components most subject to wear and breakdown after long service. Key new parts supplied are:

NEW IGNITOR

NEW MERCURY SUPPLY

STABILIZED-STEEL JACKETS— EXCLUSIVE WITH G.E.!

Water jackets of stabilized stainless steel are the reason why General Electric *alone* can bring you remanufactured ignitrons with new-tube performance! Only stabilized steel will undergo a second high-temperature baking at the factory with no corroding after-effects to the tube.

Remember— **the standard G-E warranty applies to remanufactured ignitrons! Furthermore, every remade ignitron is new-tube tested. Phone your General Electric tube distributor today!**

Progress Is Our Most Important Product

GENERAL ELECTRIC

161-1D2

Best quality chisel steel
Unbreakable steel shaft
Head silver brazed to shaft
Metal or wood grips
Model H Cone and Chisel one of 27 models

WHATEVER STYLE TOMAHAWK YOU BUY FOR YOUR JOB - BE SURE ITS ATLAS QUALITY

B-1 "Re-Bit" Dual Tool 10½" 16 oz.
B1-W "Re-Bit" Dual Tool 10½" 15 oz.
Model A Dual Tool 10½" 17 oz.
Model AW Dual Tool 10½" 16 oz.
Model E-1 "Re-Bit" 9" 12 oz.
Model E1-W "Re-Bit" 9" 10 oz.
Model F-1 "Re-Bit" 10" 16 oz.
Model F1W "Re-Bit" 10" 14 oz.
Model G Chisel & X-Chisel 9" 14 oz.
H-9" 14 oz. L-10" 17 oz. Cone & Chisel
Model I Chisel & X-Chisel 9" 13 oz.
J-9" 13 oz. N-10" 15 oz. Cone & Chisel
LCP-10" 17 oz. HCP-9" 14 oz. Cone & X-Chisel
Model K Cone & X-Chisel 10" 17 oz.
JCP-9" 13 oz. NCP-10" 15 oz. Cone & X-Chisel
Model M Chisel & X-Chisel 10" 15 oz.
Models WH: 10-20-30 12" 14 oz.
Model C "Re-Bit" Chisel & symbol
Model CW "Re-Bit" Chisel & symbol
Models OCC—OCP—ODC 9½" 10 oz.

You Can't Beat ATLAS Quality

The modern Atlas plant is devoted exclusively to building the finest weld cleaning tools in America. There are models to suit the man and every type work. If you haven't tried Atlas you don't know what a difference "balance and feel" can make in production and quality of work. They can take it.

ATLAS WELDING ACCESSORIES INC.

707 E. LEWISTON AVENUE, FERNDALE 20 (DETROIT) MICH.

Letters should be addressed to: The Editor, WELDING ENGINEER, 12 E. Grand Ave., Chicago 11, Ill. No letter will be published unless signed, but your name will be withheld if requested.

Welding Scholarship

Dear Sir:

I have just finished reading your May editorial "Teach 'em to weld—here's how!" It will interest you to know that the Los Angeles Section of the American Welding Society recognizes the shortage of engineers, particularly in the welding industry. At the Section's last executive committee meeting a scholarship fund was approved for a one-year scholarship.

The award will be made to a senior university student majoring in engineering. The student receiving the award will be chosen by an educational committee. Dr. Alan Flanigan of the University of California, Los Angeles, will be chairman.

Our Section hopes to include junior college students. We believe the scholarship fund will draw the attention of numerous engineering students to the welding industry. The students will have to write a thesis on welding to qualify for the scholarship.

David P. O'Connor
American Welding Society

The Engineer Shortage

Dear Sir:

Almost beyond a question of doubt, the majority of men in the welding industry will agree with the April editorial assertion that there are too few welding engineers and technicians.

An effort has been made by engineers of other fields to include the duties of the welding engineer, but because of inadequate background, academically and practically, they are incapable of answering more than the most fundamental question.

Only a man trained as a welding engineer can successfully fill the technical void between the experience of the practical man and the theory of the engineer.

The primary reason for this void appears to be the deplorable lack of coordination in the entire field of weld-

Here's evidence of the superior flashback* resistance built into PUROX TRADE-MARK BLOWPIPES

This is an actual excerpt from a recent Salesman's Report:

"... The superintendent wanted to know what the PUROX *W-202 blowpipe's characteristics were concerning flashback. I told him to go ahead and try it. He then lit a standard welding head and placed it against a block of wood six inches square. It bit its way into the block two inches deep before the tip of the welding head began to melt off. BUT ALL THE WHILE IT KEPT BURNING WITH NO FLASHBACK...."*

We don't guarantee that every blowpipe can be maltreated this way with the same results. But that's the simple truth about the flame stability and flashback resistance of the PUROX W-202 Blowpipe. Your present welding and heating work may not demand the limits of its outstanding performance. Still the reserve that's there—if and when you need it—is your continued assurance of steady, dependable operation and your safeguard against repair bills.

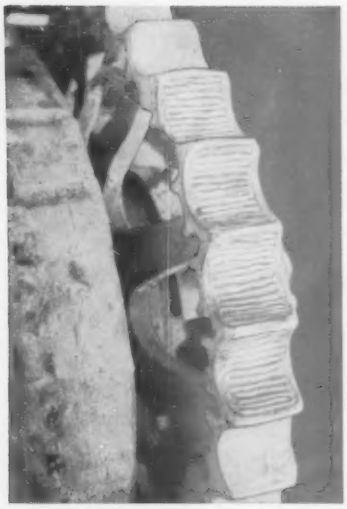
See for yourself the many additional features that put the PUROX W-202 Blowpipe so far ahead of the field in economy, ease of operation, and low cost maintenance. Enjoy tomorrow's standards today. Ask your LINDE jobber for a demonstration. Or write to LINDE AIR PRODUCTS COMPANY, a Division of Union Carbide and Carbon Corporation, 30 E. 42nd Street, New York, N. Y. In Canada: Linde Air Products Company (formerly Dominion Oxygen Company), Division of Union Carbide Canada Limited, Toronto.

* *"A flashback occurs when the flame disappears from the end of the tip and the gases burn within the torch or beyond the torch in the hose, usually with a shrill, hissing sound."*

—Definition from THE WELDING ENCYCLOPEDIA, *Thirteenth Edition.*

Get it from your LINDE jobber

The terms "Linde" and "Purox" are registered trade-marks of Union Carbide and Carbon Corporation.



INTERMITTENT PASS used in hardsurfacing sprocket reduces rebuilding time and alleviates grinding by sand and mud.

TRACTOR IDLER shows herring-bone pattern of hardsurfacing created by intermittent pass. Grind and wear is reduced by this method.

Welder develops hardsurfacing shortcut using RANITE and intermittent pass

IN LOOKING for a more economical and quicker way to hardsurface tractor sprockets and idlers, Welding Foreman Art Powell of the L. E. Webb Construction Co., Inc., Santa Maria, Calif., hit on the idea of applying Ranite metallic coated hardsurfacing materials with an intermittent pass. In using this technique Powell lays down alternating beads with a gap between.

After trying other methods, Powell found this combination required less rebuilding time and at the same time effected a substantial dollar saving on each job.

Tractors of the Webb Construction Co. operate in both loose sand and mud with parts subject to continual heavy abrasion. When an intermittent pass is used on sprockets and idlers, resulting gaps formed between beads provide escape channels for the sand and mud, reducing grind and wear on these parts.

ART POWELL, welding foreman for L. E. Webb Construction Co., Inc., long-time Ranite user, combined Ranite with intermittent pass to reduce hardsurfacing time.

Although the Webb Construction Co. has been a Ranite user for more than two years, this is the first time Ranite was used for tractor maintenance and applied with an intermittent pass. Both Ranite "A" 3/16 and "B" 3/16 are being used for this purpose. Ranite was selected for its fast deposition rate, its resulting smooth weld bead and because it will not work harden.

Prior to shifting to Ranite, rollers were either sent out for rebuilding by automatic or were replaced with new ones. Actual savings now produced by using Ranite over automatic is $6 per roller with savings on sprockets and idlers totalling more than half previous costs. In addition, Webb Construction Co. has reduced actual hardsurfacing time by 50 per cent with the Ranite and intermittent pass combination.

Original parts used by them have a normal life expectancy of between 2000 and 3000 hours. Indications of Ranite hardsurfaced parts checked at 1000 hours of use are that the service span will be increased as much as three times.

Ranite, manufactured by Rankin Manufacturing Co., is the original metallic coated hardsurfacing rod in use throughout industry since 1938. It is made in several grades with a rod available to fit any hardsurfacing job. Toughness in proper relation to hardness is the answer to any wear problem and Ranite is alloyed on this principle with each grade being proportioned to give maximum wear for the job it is designed to do.

Cut your hardsurfacing time and costs now by shifting to Ranite. There's a Ranite rod for your particular application. For further information see your Ranite distributor or write to

Ranite
HARDSURFACING
WELDING MATERIALS

RANKIN
MANUFACTURING CO.
DEPT. E-1
616 SO. MARENGO AVE.
ALHAMBRA 2, CALIF.

ing operations. The discoverer of a new idea chooses to remain a single, selfish, egotistical entity with his discovery. As a result there is no coordinated clearing house for welding ideas except to write to each concern for brochures and literature.

Repetitive and duplicating tests also force many into an apathetic attitude. At one large western installation, a weldor employed by a contractor on primary installation is required to pass eleven qualifying tests on pipe alone. If that same weldor becomes employed by the operational contractor, he must requalify on five pipe-welding tests, each an exact duplicate of those previously passed.

Welding tests are a necessity but once a man has passed the requirements for a certain phase of welding let that man retain some dignity in the knowledge that he is qualified, regardless of employer or locale, for a specified time.

With the establishment of industrial dignity, there are many more men who would become interested in furthering their education along professional welding paths. With some seeking professional degrees, demand for facilities on the undergraduate level would have to expand.

Under existing conditions there is just about one group to furnish welding engineers—the men actively engaged in the field. Often these men have worked long enough to be at an average age older than the college freshman. To return to school requires considerable thought, especially if a family is concerned.

To compensate for the above difficulty, let us investigate the possibility of perhaps half of the total time being spent on the job, studying many of the basic courses by extension.

Let's also arrange for credit for practical experience. Let us eliminate the irrelevant, time-consuming, and mostly unnecessary, cultural, or liberal arts courses, that have no bearing on engineering.

Allen Short
Toppenish, Wash.

Dear Sir:

I have read the April and May editorials about education of engineers and I agree with you, in part. But why give them an extra year's free training?

Why not require the engineering student to spend his vacation period working in his particular field to earn the money for the next school year? Then, instead of writing a paper, require the student to demonstrate his knowledge to someone who is skilled in that trade.

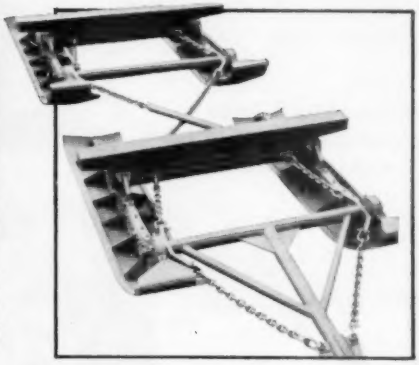
Frank Tinker
Belknap, Mont.

Operation Deepfreeze sleds plow across Antarctica on tough skis of USS "T-1" Steel

IGY IS THE REASON. Scientists with the current Navy expedition to Antarctica will obtain scientific data on weather, atmospheric conditions, aurora and air glow, glaciers, geomagnetism, and allied subjects during the next International Geophysical Year (1957 and 1958). Tractor-drawn trains of cargo sleds, built by Otaco, Limited, Orillia, Ontario, Canada, will be used to haul supplies. Skis for the sleds are made of USS "T-1" Steel.

THE SKIS ARE MADE OF USS "T-1" STEEL. When the going gets rough, the runners on these cargo sleds are assembled into skis, 13 feet long and 34 inches wide, made of USS "T-1" Steel.

DURING OPERATION DEEPFREEZE, the Navy's current expedition to Antarctica, thirty-eight rugged cargo sleds will be used to haul supplies 400 miles from Little America to Marie Byrd Land. The 11-ton sleds, each carrying a load up to 20 tons, ride on skis made from tough ¼" plates of USS "T-1" Steel. The sleds were designed jointly by the United States Navy and Otaco, Limited, Orillia, Ontario, Canada.



Naturally, the skis had to be made from a steel that stays tough and durable at temperatures far below zero. The steel also had to possess high strength (to keep down weight), and excellent resistance to abrasion (to withstand the 400-mile trip across rugged, ice-covered terrain). In addition, the steel had to have good forming characteristics and be easily weldable (to simplify fabrication).

One steel met all the requirements; that was USS "T-1" Steel. USS "T-1" Steel has a minimum yield strength of 90,000 psi . . . can be welded as easily as carbon steel, with the proper electrodes . . . has excellent resistance to abrasion and impact abuse . . . and remains tough at low temperatures. It was ideal for this tough job.

A VERSATILE NEW ALLOY STEEL

USS "T-1" Steel is adding strength and durability, cutting weight and costs, in steel mill equipment, power shovels, mine cars, bridges, coal handling equipment, pressure vessels, and many other applications, at high and at low temperatures. It probably can help you improve your own product. Write for complete information. United States Steel, Room 5354, Pittsburgh 30, Pa.

UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST • UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS "T-1" CONSTRUCTIONAL ALLOY STEEL

USS

See The United States Steel Hour. It's a full-hour TV program presented every other week by United States Steel. Consult your local newspaper for time and station.

UNITED STATES STEEL

DAFFIN MFG. COMPANY PUTS

...saves up to 30% in welding time with A. O. Smith SW-44 electrodes

DAFFIN Mfg. Co., originator of the revolutionary Daffin Mobile Feed Mill, uses A. O. Smith SW-44 (AWS Class E-6024) iron powder electrodes for 100% of the manual welds required to fabricate their unique unit. Since they switched to SW-44 electrodes, they've greatly reduced welding time per unit . . . been able to make overall savings of more than 30%.

Daffin's experience has been that these amazing electrodes deposit far more metal than conventional electrodes — and do it in less time — without popouts. They also report that SW-44 iron powder electrodes produce better-appearing welds . . . and that self-peeling slag all but eliminates cleaning.

If you'd like to know how A. O. Smith electrodes can help you in your welding operations — in terms of time and effort economies, greater weld strength and appearance, and overall dollar saving—contact your "man from A. O. Smith."

PRODUCED BY WELDERS — FOR WELDERS

Because welding is our full-time business, we offer you America's finest welder-proved electrodes, machines and accessories.

Through research A.O. Smith *. . . a better way*

A.O.Smith

CORPORATION

WELDING PRODUCTS DIVISION

Milwaukee 1, Wisconsin

International Division: Milwaukee 1, Wisconsin

The man from A.O.Smith

James Bates is the A. O. Smith welding representative who services the Daffin account. More than a salesman, he's a welding specialist, ready and eager to help with any problem.

FEED PLANTS ON WHEELS!

How mobile feed mills are revolutionizing the feed business

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JULY, 1956

Welding Engineer

ESTABLISHED 1916

No time for complacency

JULY is an important month in United States history. But in recent years that history seems to have lost much of its importance.

From the mistakes made by this and past administrations, it appears that many of our government leaders have never studied history. A few patriotic individuals are now demanding that more American history be taught in our colleges. We can be thankful that some educators are beginning to recognize this need.

Apparently, patriotism is not so important now as it was when we were youths. Rarely do we see the American flag flying from a home, even on such important days as Flag Day and the Fourth of July. Too many of us are *complacent*—which, according to the dictionary, means *"satisfied."*

Strangely enough, a great many of us seem even more than satisfied if we can reach such a state. A great many Americans, in fact, don't seem to care what happens, so long as it does not happen to them.

In 1913, when Congress was considering the income tax law, we were told that the tax would never exceed 5% of one's income. Like so many Congressional promises, however, this one meant nothing. Right now, the tax collector has the power to take 91% of the income of those fortunate enough to make a taxable income of $200,000 a year.

IF A PERSON is successful enough to build an estate under such a tax program, the government upon his death can again come in for as much as 77% of what he might leave.

Surely we have to pay taxes, and those that aren't making top-bracket incomes will tell you that they would be glad to pay 91% income taxes. Maybe so, but there is certainly something wrong when a messenger boy making $14 a week also has to pay income taxes.

Another unfortunate aspect of our income tax program is the socialistic manner in which these taxes are deducted from your salary before you see them. It is a painless tax-collection method, but maybe people would not be so complacent if their payments actually hurt a little—or a lot.

There would probably be more concern about foreign aid—a program that has cost us $140 billion in the past 10 years. If the average citizen knew that he was coughing up $100 a year for such a program, we are sure that he would be less complacent about foreign aid.

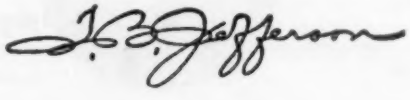
WE ARE pretty complacent about the national debt, too. We have been told over and over that it is no burden because "we owe it to ourselves." Actually, the national debt embodies claims by people who have lent funds to the government against all those who are daily producing new wealth. It imposes a burden upon the producers of today for the benefit of another group of people.

This vast public debt has caused the value of the American dollar—particularly every dollar saved prior to 1940—to shrink to a 50¢ piece. The complacent American people don't seem to mind this fact so long as their income keeps up with the cost of living.

Complacency hits us not only in government affairs, but quite specifically in the welding field. There are many welding distributors who are not satisfied with their lot in life, so they are not doing the job of selling welding. The same can be said about welding contractors and engineers . . . or even about weldors, who don't particularly care so long as they have a job.

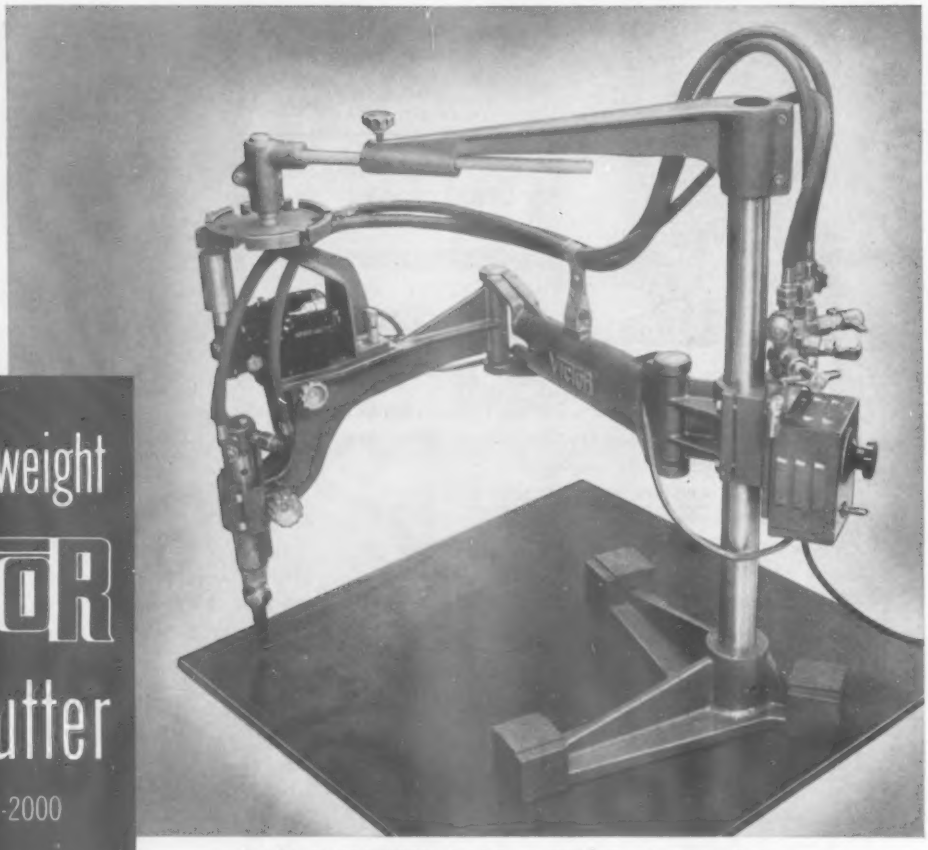
Continued complacency is dangerous. We might wake some day to find we have lost our freedom. And complacency in welding means the industry will grow at a snail's pace.

Complacency about a program to expand welding educational facilities will make the growth of welding that much harder.



New, lightweight VICTOR Duplicutter

MODEL DC-2000



Portable Model DC-2000 cuts circles to 19½" diameter, rectangles to 12" x 35", and metals to 8" thick. Torch accommodates all Victor 1-101 and 1-100 cutting tips, through size 5.

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LAPPED seams are preferred, and oxyacetylene soldering iron applies stainless silver alloy. Low-heat joining prevented base metal embrittlement.

Soldered stainless resists acid corrosion

By Herbert Drapkin
Chief Engineer
Anchor Metal Co., Inc.
Brooklyn, N. Y.

PRODUCTION in one of the nation's largest cotton mills was periodically impeded by failure of welded and silver-soldered joints in stainless steel ducts carrying bleaching and finishing solutions.

Attacked by a combination of hot chlorine, sulphuric acid and caustic soda, the weldments developed porosity and soldered joints turned black and cracked. In both cases, corrosive liquids leaked out and duct seams had to be repaired immediately.

Each time this occurred, the mill was faced with expensive downtime and excessive maintenance costs. Several repair methods proved unsatisfactory.

Welding obviously was not the answer because it was difficult to obtain tight welds in the thin-gage steel. Effects of thermal expansion and contraction were the reasons.

Conventional silver solders applied by oxyacetylene torch were also unsuitable due to the high heat (upwards of 1,250 F) which had a tendency to cause steel embrittlement.

Company engineers realized the need for a joining material that would fulfill these requirements:

1. Be strong enough to join stainless types 302 and 308.

2. Be applied with low heat methods.

3. Have a formulation capable of withstanding corrosive action of acid solutions for an indefinite period.

Application Method

They turned to a new stainless steel silver alloy which has a melting point below 450 F and can be applied with a soldering iron. Developed simultaneously with the solder was a highly activated stainless steel flux.

The solder provides joints with tensile strengths up to 28 psi and shear strengths to 15,000 psi. It is reportedly able to resist chemical interaction of acid solutions better than the parent metal itself over a period of years.

Ordinarily, soldering of stainless steel is difficult since surface oxides are extremely tough and impede proper alloying of solder to base metal. Skilled soldering technique is important, but the most experienced worker cannot obtain tight joints unless flux eliminates surface film and solder assures maximum wettability.

As a preliminary test of the solder's effectiveness, it was first applied directly over the welded joints. This is not customary procedure, but since there was the possibility that the ducts might have to be scrapped at exorbitant cost unless they could be salvaged, the solder was tried in a "do-or-die" attempt.

Stainless Brush Used

The welded areas were cleaned with a brush containing stainless wires; the flux was applied, and weldments were completely covered with silver alloy. Inspection of soldered joints after six months revealed that solder had sealed up previously porous joints and ended leakage of bleaching solutions, thus saving thousands of dollars.

Following this test, new ducts for expanding cotton goods production were prepared in this manner:

Lapping edges were pre-tinned for a 1-in. width along the full length of the seam. Flux was painted on and heat applied by an oxyacetylene soldering iron held to the underside of the lap.

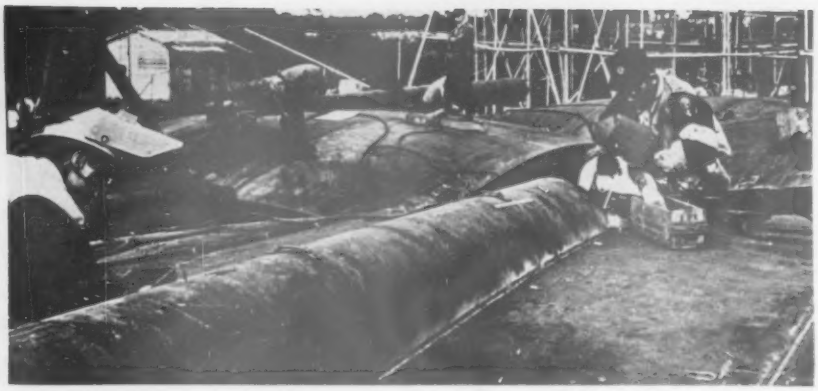
This type of iron proved most satisfactory for stainless steel since it is fast, maintains a constant temperature in the longest runs, and will not exceed 500 F in any given spot.

The $\frac{1}{8}$-in. wire solder was run along the edge and melted on contact with the heated steel. The flux effectively removed surface oxides and molten solder tinned the seam edges in a thin, even coat.

Final seam closing was accomplished by clamping the two edges (to prevent possible movement) and tack soldering in several places. After clamps were removed, more flux was brushed on. After the iron brought the steel up to proper heat, solder was melted against the bit in one almost-continuous flow.

A minimum amount of solder was required to fill joint area. After the flux residue was washed off, the duct was ready for installation.

The soldered ducts have been in constant use now for over a year, and there are no leaks or deterioration of the joints due to corrosive liquids or vapor.



ALL-Japanese welding crew used low-hydrogen E12016 electrodes on entire job. Large assembly is being fabricated on the ground by these welders.

In Japan — weldors erect new T-1 steel vessels

By Jack Fairlie

A REMARKABLE technical ability is probably one of the outstanding reasons behind Japan's 20th century emergence as a first-rate world power. This engineering aptitude also may be *the* most important framework on which Japan has based its highly successful bid to regain the lost trade links so vital to its economy.

Pointing up the ready and successful application of this ability to a new, somewhat complex structural design, Japanese workmen recently completed welding two U.S.-supplied pressure vessels which were fabricated with a new type of steel.

Gas Storage Vessels

Caught up in the maelstrom of postwar growth and expansion, Tokyo Gas Co. taxed its facilities to the fullest in an attempt to meet growing demands, then cast about in search of a vessel design suitable for the storage of manufactured gas.

The company found what it wanted in the all-welded "Hortonspheres" designed and fabricated by Chicago Bridge & Iron Co. Compared to *finding*, however, the problem of *getting* assumed heroic proportions.

To begin with, the two 110-ft-diameter vessels (each with a 10,000,000 cu ft capacity) needed immediately by Tokyo Gas would have to withstand an operating pressure of 71 psi. Mild steel capable of holding such pressure—under extremes of climatic and seismological conditions—would have to be approximately 2 in. thick.

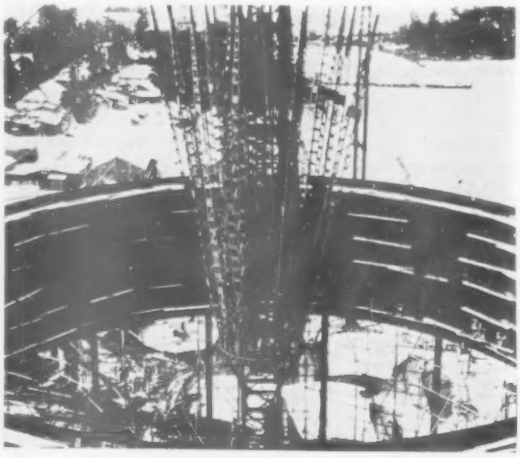
Since plate for the tanks was to be shipped from the United States, 2-in.-thick material obviously constituted a ponderous and expensive weight problem. But it was a problem that was solved by CB&I through knowledge gained earlier in testing the new T-1 steel.

Added Strength

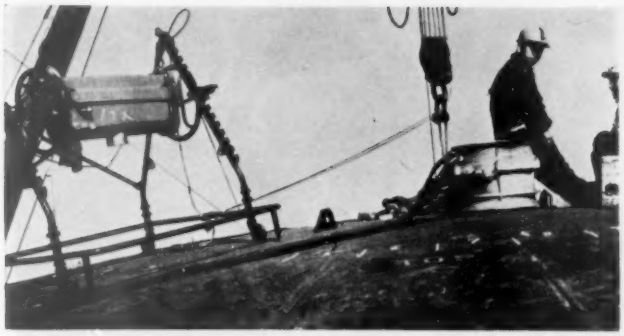
This high-strength, low-alloy steel, with a minimum yield of 90,000 psi, had successfully proved its weldability and all-around performance on approximately 10 jobs contracted by CB&I for such hard-to-please customers as the Air Force and the chemical and paper industries.

The exceptionally high strength of T-1 reduced the necessary plate thickness requirement for the vessels to $\frac{3}{4}$ in., thereby saving greatly on shipping charges.

Major problem No. 2, which also had to be dealt with before work could be started, was the threat posed by Japan's recurring earthquakes. Since ordinary supports employed by Chicago Bridge might not withstand the impact of a serious tremor, project engineers delved into the *if's*, *and's* and *but's* inherent in structural



MULTIPLE-boom guy derrick in center of new sphere held T-1 steel courses in place for welding operations.



RADIOGRAPHIC team takes a breather while X-ray unit inspects welded seams atop "Hortonsphere." Job was 100% X-ray inspected.

WORKER squats high on scaffolding around sphere to place gas burner against seam for preheating. Continuous, uniform preheat of 200 to 300 F was maintained.

flexibility and the effect of stress loads.

Results of their efforts were braces which are pin-connected to all tank support columns, and struts which connect the foundation piers. Thus, all tank support elements work together to help the vessels withstand heavy seismic impacts.

Welding Begins

With initial problems out of the way, CB&I dispatched the necessary amount of T-1 steel by ship for Tokyo early in 1955. On July 1, 1955, Japanese weldors gathered at the work site in the capital city to begin operations.

Though welding and other related construction jobs were performed by the Japanese workmen, CB&I furnished assistance through one stateside superintendent and two highly trained welding supervisors.

Only manual welding could be employed in fabricating the spherical vessels. Three and four-plate assemblies were welded on the ground before installation. Carbon arc air torches were used for back gouging all welds.

Low-hydrogen E12016 electrodes, used throughout the entire job, were initially employed with economical a-c welding machines. A switch to d-c power sources was made soon afterward, however, to obtain better arc characteristics. Three electrode sizes, 1/8, 5/32 and 3/16 in., were used on the tanks.

Need for Preheat

No preheat was used when the job was started, but when subsequent radiography indicated some cracks in the welds, a continuous and uniform preheat of 200 to 300 F was maintained with gas burners. The burners were placed against seams on the side opposite to that which was being welded.

Work had to be performed under conditions "about as bad as you'll experience anywhere," according to CB&I representatives. An excessive amount of snow and rain not only slowed the progress of the job, but also endangered the weldors' supply of low-hydrogen electrodes.

Because of their extreme sensitivity to moisture, the electrodes were placed in a temperature-controlled oven at the job site. They were removed from this oven only as needed.

100% X-ray Inspection

Over 8,000 ft of seam welds on both tanks were inspected on a 100% basis by X-ray units. Both X-ray machines and film were Japanese-made, and most of the inspection procedure was performed on the ground before plate sections were swung into place.

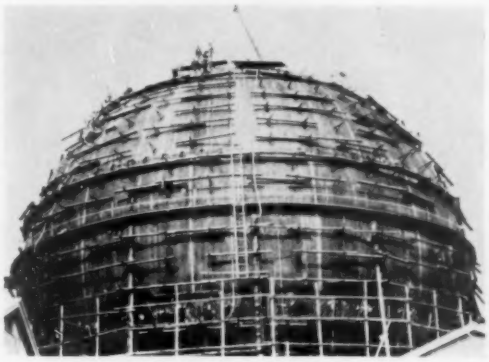
Completed in approximately 10 months, and pneumatically tested at 90 psi (19 lb over maximum operating pressure), these vessels are the first of several similar installations which CB&I will supply and supervise for Tokyo Gas Co. A second contract, already in the planning stages, calls for tanks fabricated of $1\frac{1}{8}$-in.-thick T-1 steel with E10015-16 electrodes to hold a higher working pressure of approximately 90 psi.

Why T-1? CB&I cites two important reasons:

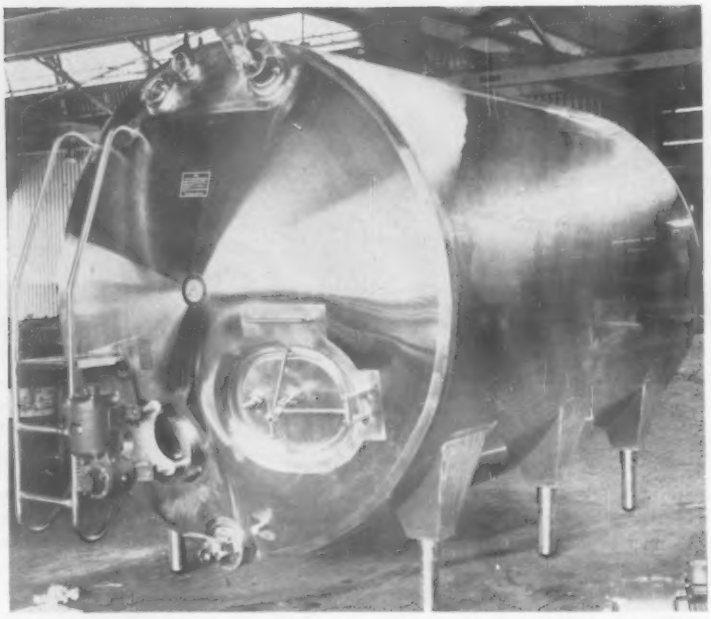
1—It has high tensile strength—a desirable factor in any situation, but doubly important here because it allowed a cut in plate thickness, savings on shipping charges and easier material handling at the job site.

2—There is a high *toughness* factor in T-1 which has the ability to absorb large quantities of energy under conditions of low temperature, yet perform in a ductile manner without brittle fracture.

In view of these important considerations, Tokyo Gas Co. has obtained satisfactory vessels and, at the same time, has minimized shipping and fabrication costs—advantages that are sought by growth-minded firms everywhere in the world.



AFTER 8,000 ft of seam welds and 10 months of weather-interrupted work, this gas-storage tank stands completed. It will operate under a pressure of 71 psi.



SPOTLESS example of all-welded, carefully polished fabrication is this stainless steel storage tank. Finish grinding and buffing on this and similar products at Cherry-Burrell Corp. consumes double the actual welding time.

Welding... for sanitary seals of stainless

The Cedar Rapids plant of Cherry-Burrell Corp. could well be used for a study of various ways of welding stainless steel. Not exactly a production-line facility, it resembles more a large custom job shop, for much of the equipment is built to customer specification.

By F. T. Tancula

EQUIPMENT used by the dairy and food-processing industry must be free from cracks, porosity and other discontinuities that might become breeding places for harmful bacteria. To insure one-piece construction of food and milk containers in its equipment, Cherry-Burrell Corp. uses welding to join walls of stainless-steel storage tanks, vats and other containers.

At its Cedar Rapids, Iowa, plant, this leading manufacturer of such processing equipment employs many different kinds of welding, including manual arc, Mig, Tig, submerged-arc and spot and seam welding. Applications are manual, semiautomatic and automatic. Silver brazing is another joining method vital to the fabrication of this company's products.

Most of the stainless used is 300-series material, although some 430 (chrome series) is used. The latter finds applications only where it will not come into contact with dairy products.

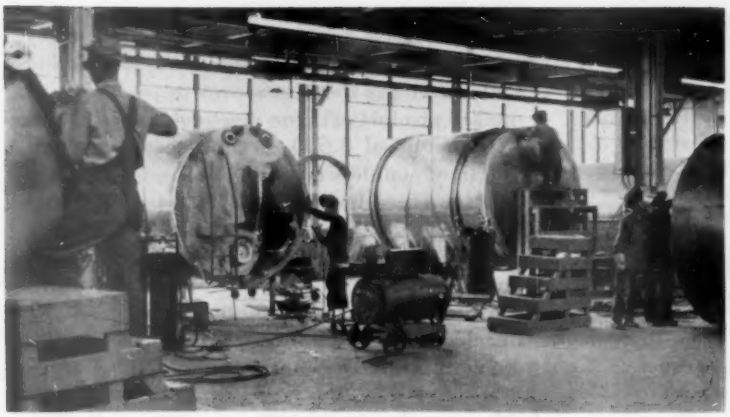
The plant does not have a continuous production or assembly line. The usual hubbub connected with mass-production, assembly-line operation is absent. Despite its large floor area, the Cherry-Burrell facility resembles a job shop, for much of the equipment is built to customer specifications.

In one floor area, you will find weldors fabricating milk storage tanks; in another they will be welding ice-cream freezers.

Spin Own Heads

Heads of both stainless and mild steel for cylindrical-type storage tanks are spun on machines built by the firm itself. These heads range in diameter from 60 to 110 in.

Cherry-Burrell fabricates all-stainless tanks and tanks with mild-steel outer jackets and stainless inner shells. About 75% of all such tanks are built in accordance with the ASME code for unfired pressure vessels. All are



INDIVIDUALLY-tailored storage tanks receive both welding and finishing operations in this area of the C-B plant. Selenium rectifier machine types receive wide use as d-c power sources throughout shop.

ONE mild steel and one stainless flange are fillet welded to either end of this pure nickel tube with E304 lime-coated electrodes.

tested at 400 psi by hydrostatic testing methods.

Another code to which all such products must conform is the Three A (three associations—U. S. Public Health Service, International Association of Sanitarians and the Sanitary Standards Subcommittee of the Dairy Industry Committee). This latter regulation specifies a high-lustre finish for all equipment coming into contact with food or milk.

As a result, C-B normally has to spend two hours in grinding and polishing for every hour it welds on stainless.

Some tanks are refrigerated; others are not. Most of the larger units have 10-gage heads and 12-gage shells, while smaller tanks have 12-gage heads and 14-gage shells. Tank capacities range from 600 to 7,000 gal.

Mild Steel to Stainless

One of the set-ups at the Cedar Rapids works includes an automatic Tig machine that is used for welding mild-steel panels to stainless sections of a storage tank.

The cold-wall or refrigerated section comprises half-sections of tubing that have been welded to a panel of stainless by the submerged-arc process. At this station, welding wire is type 308 stainless, and flux is the same used in welding mild steel by the submerged arc. (An example of the latter: welding together two halves of a head for an outer jacket of a storage tank.)

This tubing wall, or refrigerant manifold, is then manually arc welded to the cold-wall section of a tank by means of E308 titania electrodes. The wall and manifold are type 304 stainless.

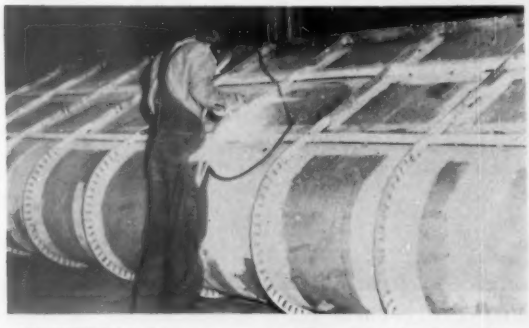
Before going through the submerged-arc station, however, the tubing has been manually tack welded for alignment by Tig. Depending upon the size of the tank, the tubing and sheet is 14, 12 or 10-gage stainless.

In this manual Tig set-up, argon is used as the shielding medium. Helium is the shielding agent for the floor station where additional sheets are welded to complete a cold-wall section. Here, too, type 308 stainless is used as filler wire, and the power source is a selenium-rectifier, d-c machine, using straight polarity.

An additional control unit operates the coolant (water), weld current, helium flow and travel carriage. One switch thus operates the entire mechanism and all accompanying feeds.

Mig Uses Argon/Oxygen

Some typical settings and feeds: for 10-gage stainless, 400 amp, 20 ipm and helium flow of 18 cfh; for 20-gage, 250 amp, 62 ipm and gas flow of 18 cfh. While helium is used at this weld operation, most of the other Tig operations use 100% argon. In Mig operations a



STIFFENING bars are manually arc welded to this huge germ separator tank destined for food processing plant. Electrode is titania-coated E316.

SEAMS of this 250-gal milk storage tank are welded by manual Tig process. Note Tig spot welds on tank stiffeners and power-driven fixture.

mixture of 98% argon/2% oxygen is employed as the shield.

In order to help starting on this automatic Tig set-up, as well as at the submerged-arc station, high frequency is superimposed upon the d-c straight polarity current. This h-f unit, used only during the first 15 seconds of the control cycle, is then automatically shut off.

Cherry-Burrell uses a heavy cork insulation between inner and outer walls of the storage tanks described above.

Another piece of dairy equipment that has presented more than just a few welding problems (long since licked by C-B) is the ice-cream freezer. One component especially noteworthy for its variety of materials consists of a pure nickel tube to which is welded two flanges at either end . . . one of mild steel, the other of stainless (*see photo*).

To join this nickel to the two steel types, Cherry-Burrell specifies an E304 electrode with lime coating. This electrode is used, according to Neil Briehl, welding engineer, to get a greater throat section and to avoid cracking. Simple fillets are employed.

Manual Arc to Mig

At the time of this writing, C-B was conducting experiments with a view to replacing the manual process with a Mig application, wherein a 98%/2% argon/oxygen mixture would be used as the shield and the work placed on a rotating positioner.

One example of a Mig operation presently used in the production process is the welding of the set-back assembly, a bearing used for the agitating device on milk-storage tanks. At this weld station, a 1/16-in. mild-steel wire is the electrode; the shield is the aforementioned 98% argon/2% oxygen mixture; power source is d-c reverse polarity at 325 amp; welding speed is 20 ipm, with work placed on a rotating positioner.

In the farm tank, a smaller unit used by farmers for storing milk until pick-up, a great amount of Tig is used for spot and seam welding applications. A copper back-up bar for the Tig spots is an integral part of the power-driven fixtures upon which these tanks are welded. The spot welds join stiffeners to the milk tank. About 200 spots are made on a 285-gal-capacity tank.

Cherry-Burrell certifies all its own weldors according to both the ASME and Triple A codes.

Cherry-Burrell, leading manufacturer of dairy and food processing equipment, has long found that welding is the best means to produce top-quality products . . . no riveting is used at all.

In a typical 3,000-gal storage tank, about 100 lb of stainless type 308 electrodes are used . . . for every hour of welding, states welding engineer Neil Briehl, C-B spends two hours grinding and polishing . . . making finishing one of the most expensive aspects of its work.

In addition to the 1,800 lb of stainless welding electrodes and filler wire used, C-B in a single month utilizes about 500 oz of BAg-7 silver-brazing wire . . . this type is used because of its color match with stainless . . . some applications: joining hinges . . . also brazing piping for air-agitation system on bottom of farm tanks.

98% of fixtures used at the Cedar Rapids plant were built in C-B's own shop . . .

Selenium rectifiers are a primary d-c power source . . . they have been in use for about 2½ years . . . prior to that, m-g sets were employed. Although 300-amp machines are dominant, C-B does have some 200 and 400-amp welders.

Large mechanical bottle washer, built to customer specifications and a story in itself, is fabricated mainly from mild steel, using E6024 iron-powder electrodes.

Use of Tig welding has cut grinding and polishing about 50% where it has replaced hand welding . . . C-B swears by it.

MANUAL arc welding is used to join refrigerant manifold to the cold-wall section of a tank. Components here are type 304 stainless, joined with E308 titania electrodes.

ROTATING positioner moves set-back assembly for Mig welding operation. A 98% argon / 2% oxygen mixture is the shield; welding speed is 20 ipm on this tank-agitator component.

Substituting strong steel weldments for cast iron machine bases is a smart move, says the author. Here's why . . .

From casting to weldment: designs for strength and economy

Omer Blodgett, Design Engineer
The Lincoln Electric Co.
Cleveland, Ohio

THE COST of redesigning unwieldy, expensive cast iron bases into welded steel fabrications that weigh and cost much less is not the prohibitive factor that some may think it is.

Redesign can *economically* be accomplished without the need for complicated calculations and extensive fabrication operations.

Rigidity and strength equal to, or greater than, that obtained with cast iron bases are the advantages claimed for steel weldments. This claim is a reality, and several additional *plus* factors also are realized in a change-over.

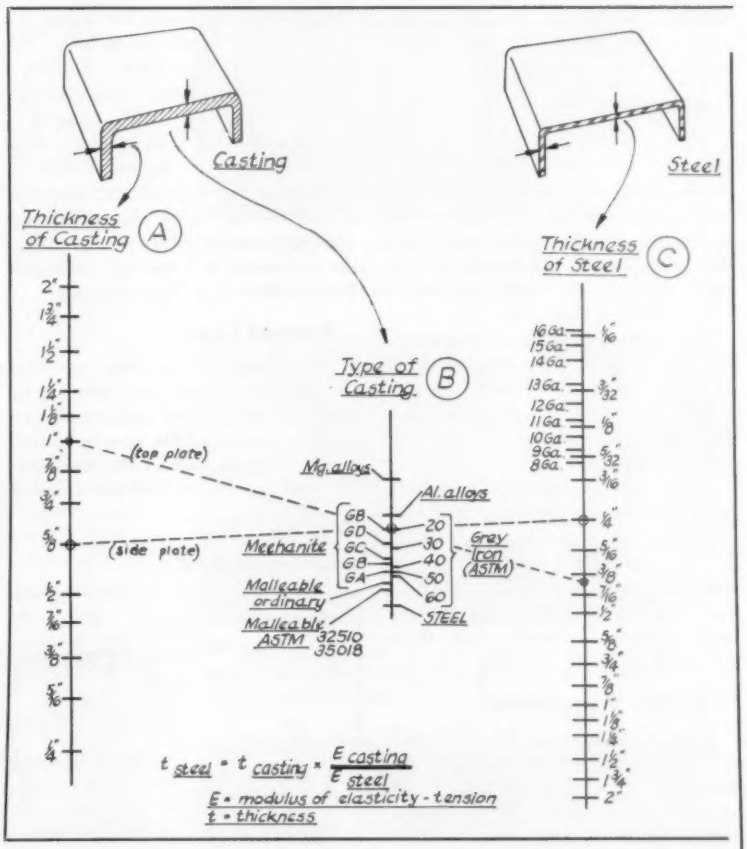
To see just what they are, follow these two relatively simple steps in redesign.

Step No. 1

An example chosen to illustrate this redesign is an ASTM class 20 grey iron motor and pump base 6 in. high, 30 in. wide and 60 in. long. Sides are 5/8 in. thick, and the top panel is 1 in. thick.

With one 1-in.-thick rib across its width, this base weighs almost 700 lb and might normally cost about $80.

Using Nomograph 1 on this page, the conversion factors that make up Step No. 1 can easily be determined. Draw a line from the known thicknesses of cast iron top and sides (A) through the casting designation in the center of the chart (B), and extend it to the steel thickness line (C).

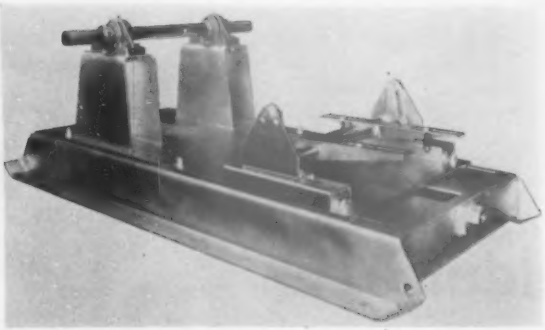


Nomograph 1

Point of juncture with the latter line will give an accurate thickness ratio for steel plate to be welded. *(The sample lines drawn on Nomograph 1 follow this example.)*

In this instance, it is apparent that conversion could be made from a 1-in.-thick cast iron base to a welded steel base approximately 3/8 in. thick. The 5/8-in.-thick cast iron side plate could be replaced by 1/4-in. steel. *The steel base would thus weigh less than 300 lb and total cost would be a mere $30-35.*

Second step in this redesigning operation is a determination of the span of the steel top panel between stiffen-



SIMILAR in many respects to the machine base type cited in the text, this base has economical flanged-leg design.

COMPRESSOR turbine base is all welded. Top plate is only ½ in. thick; sides are structural rolled channels.

ers. Nomograph 2 will give the ratio of steel span to cast span necessary to gain rigidity equal to that of the cast section.

Step No. 2

Line A in this nomograph contains virtually all the thickness figures which could be arrived at in Step No. 1. For the sake of consistency, however, a line has been drawn from the ⅜-in.-mark—thickness of the steel plate which could supplant a 1-in.-thick cast iron plate.

Again, the line is extended through the casting type (No. 20 grey iron) and on to reference line C. At this point, the line should be drawn through casting thickness (1 in.) and joined with line E.

Since the cast iron plate had a 30-in. span beteween stiffener and side plate, the steel replacement should have a span that is equal to 52% of this area, or approximately 15 in. To keep rigidity equal, therefore, the steel weldment should have three stiffeners on 15 in. centers.

Further Improvements

Ends of the base are not dealt with specifically in the nomographs because they usually are the same thickness as side members. Steel stiffeners do not have to be as deep as their cast iron counterpart.

If the moment of inertia can be found for a section such as that described in the example above, shape of the base cross-section could be changed and an even more efficient design would result.

The moment of inertia (*i.e.*, the section's ability to resist bending), once determined, is multiplied by a rigidity factor that is the percentage of the rigidity of cast material to that of steel. On Nomograph 1, this percentage can be found by using the value for the steel section when the cast section is 1 in. thick.

This redesign, based upon an equivalent moment of inertia, comprises a steel section of 5/16-in. plates bent into the form of a channel. Thickness is thereby taken from the top and added to the sides. An additional stiffener must be added to strengthen the top panel, and spacing can again be determined on Nomograph 2.

Flanged Legs

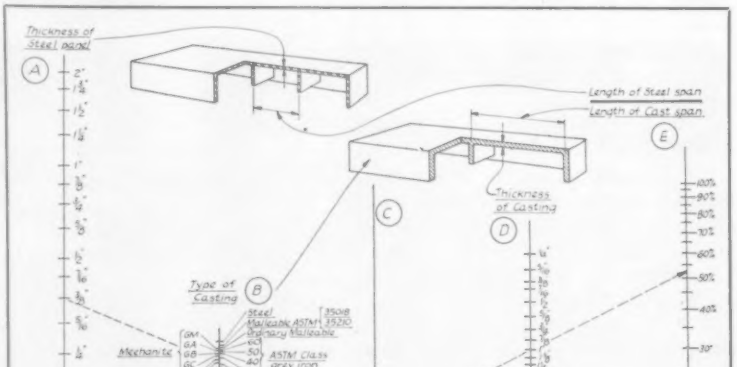
Flame-cutting (or shearing) and welding operations are reduced by such a design, but braking is an added necessity. This new operation would increase cost of the weldment in small quantities, but reduce costs for larger quantities.

Flanging the bottom legs of a base is a design feature that can increase economies without sacrificing strength. Flanged legs greatly increase rigidity of the section, so plate thickness can be reduced.

Savings made in this respect will offset the cost of additional stiffeners which are usually needed to support the thinner top panel.

The photos on these pages are excellent examples of the work that has already been done in steel weldments designed to replace existing cast iron installations. They cannot show qualities of strength or rigidity, of course, but they do indicate the complexity of design which can be achieved at a cost considerably less than that of a cast iron form of similar design.

Nomograph 2


Thickness of Steel panel
A
Length of Steel span
Length of Cast span
E
C
D
Thickness of Casting
Type of Casting
B
Steel
Malleable ASTM 3510
Ordinary Malleable
Meehanite
ASTM Class grey iron
Al. Alloy
Mg. Alloys
Example N°20 grey iron panel 1" thick
30" span
Find span of steel panel if made of ⅜ plate for equal rigidity
draw line from A-⅜ thru B-N°20 grey iron to C
draw line from C to D-1" ; read E-52%
hence span of steel panel 52% of cast panel
or 52% × 30" = 15" span
t = thickness of panel
L = length of span of panel
E = modulus of elasticity-tension

Points to remember when soldering copper tube

Copper is probably the easiest of all metals to solder, and the same is true also for its alloys—including brasses, tin-bronzes, nickel-silvers and cupro-nickels. Copper tube and copper and copper-alloy fittings are being used in ever-increasing quantities for industrial and residential construction.

By Arthur I. Heim, Research Engineer
Copper & Brass Research Association

WHILE the technique of soldering copper tube is comparatively simple, strong and leak-proof joints will result only if sufficient care is taken through every stage of joining, and if correct materials are used.

A soldered joint, sometimes called a *sweat joint*, is produced when capillary action draws molten solder alloy into a narrow space between tube and fitting. A good solder must:

(a) produce joints that have strength, soundness and permanency;

(b) *wet* the base metal;

(c) have ideal spreading qualities, and

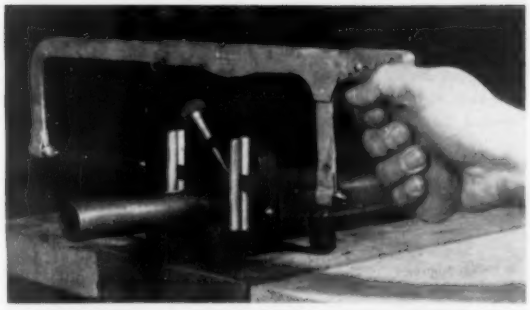
(d) penetrate capillary joints to full depth without leaving any gaps or pockets in the solder film.

These are not qualities of the solder alone, however; they depend also on proper joint preparation and on the flux used.

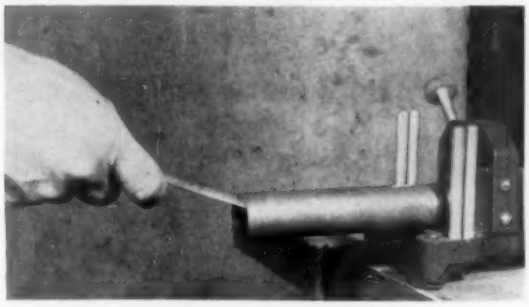
Solder Selection

Selection of a suitable solder for copper tube and fittings is best determined by estimating, first, maximum temperature of fluids to be carried by the line. For service at room temperatures and for low-pressure steam (up to 15 psi or 250 F), as well as for moderate pressures with temperatures to 250 F, a good grade of 50-50 tin-lead solder is preferred.

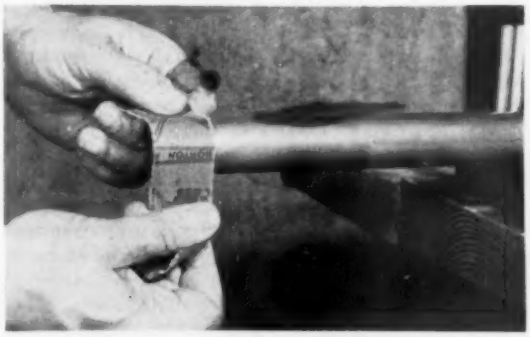
For service temperatures between 200 and 250 F, where higher joint strength is required, a 95-5 tin-



COPPER tube should be square-cut to exact length with a tube cutter or hacksaw. This vise has guides for saw blades to assure square cut.

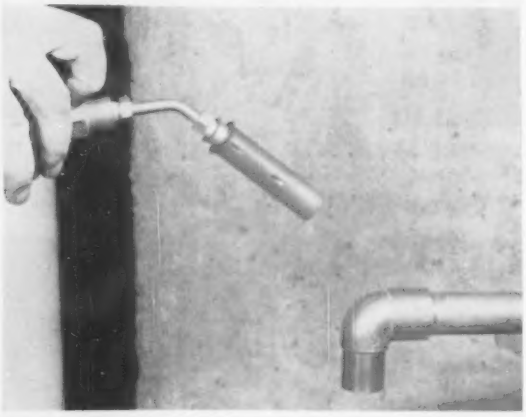


BURRS are removed by a reamer or, more commonly, by a file. Filings should be wiped from inside tube after deburring operation.



OIL, grease and heavy oxides must be removed from tube surface. Fine sandpaper or emery cloth can be used, but no parent metal can be removed.

AFTER fitting socket has been cleaned by method used on tube, a thin film of flux is applied to both tube and socket. Brushes are preferred in applying mildly corrosive flux.



WITH tube inserted all the way into fitting socket, heat of gas-air or blow torch is played over entire fitting area. Heat is sufficient if solder melts on contact with tube.

antimony solder is most commonly used.

But, since this type of solder requires a higher melting temperature than 50-50 solder and has less *pasty* range, it is somewhat more difficult to handle and requires a greater degree of soldering skill.

High joint strength for fluid service temperatures in the 250 to 350 F range is obtainable with brazing filler metals such as the silver or copper-phosphorus types which melt at 1,000 F or more.

High joining temperatures necessary to braze such capillary connections tends to discolor the tube and anneal it to some extent in the heat-affected area. For this reason, brazing does not offer many advantages where line service temperatures are below 250 F.

Providing for Movement

In a properly designed piping system, expansion and contraction will already have been provided for, so these forces will not be prime factors to be considered in solder selection.

But, if design permits the forces of contraction to cause high tension stresses on joints, these stresses may exceed those caused by internal pressure. Proper joining materials then become important to the ultimate success and safety of the job.

By actual test, a well-soldered tube joint is stronger than the tube itself for stresses of short duration. At elevated temperatures, however, when stress on the joint is maintained for long periods of time, the somewhat plastic solder may creep.

Creep strength is the ability of solders and soldered joints to resist long-continued stresses. The chief consideration of a solder for low-temperature service is to insure maximum strength and resistance to creep.

Requirements for Flux

The function of flux is to provide a solvent action on surface oxides of metals, to protect these surfaces from re-oxidation during the heating process, to float out remaining oxides ahead of the molten solder, and to promote wetting action of the solder. It should be fluid at soldering temperatures.

Fluxes for 50-50 and 95-5 solders used in copper joining are preferably prepared in paste form, consisting of a petroleum jelly base combined with zinc chloride and ammonium chloride. Paste fluxes of a noncorrosive type are preferred for copper tube soldering.

Paste-type flux will usually withstand a certain amount of overheating without losing effectiveness. Liquid fluxes generally are more corrosive than is considered desirable and are apt to be somewhat uncertain in their behavior. Thus, they serve only some of the purposes desired from a flux.

Flux Is Not a Cleaner

While flux has an essential purpose in soldering, it should not replace preparatory mechanical cleaning of metal parts to be soldered. Only mechanical cleaning gives visual assurance of complete cleanliness.

It is claimed that some fluxes are sufficiently corrosive to eliminate the necessity of precleaning. Results with this type of flux are not consistently good; uniformly tight, strong joints are almost impossible to attain without precleaning.

Strongest copper tube joints are achieved when surfaces are separated about 0.001 to 0.004 in. Space between tube and fitting must be sufficient to assure clearance for the tube to enter the fitting. If the space becomes too great, there is a reduction in capillary effect. *Result:* solder penetration may be reduced and the joint may be weakened by flux inclusions.

Preparing The Work

On horizontal joints, an oversize fitting may allow the tube to rest directly on the fitting—resulting in a double-width space at the top. If possible, such joints should be made in a vertical position before assembly.

When cutting lengths of tube, be sure the ends are cut long enough to enter fully into the socket of the fitting. If the tube is cut too short it will not penetrate deep enough, making it difficult to get a perfectly soldered joint.

Tube should be cut square, and small burrs remaining on the inside lip after cutting with a hacksaw or tube cutter should be removed with a file or scraper. After

deburring, wipe out remaining filings from inside the tube.

The importance of cleaning metal surfaces before soldering cannot be overemphasized. Even if parts look clean, there may be a film on them heavy enough to prevent a completely effective joint. Use sand cloth, fine sandpaper (00) or steel wool, but do not rub hard enough to remove any of the base metal.

Clean the tube's outer surface to about $\frac{3}{8}$ in. beyond cup depth, and the inside of the fitting cup down to the tube stop. Both parts should be shiny bright without any dark spots before flux is applied. Particles of cleaning materials should be removed.

The Soldering Operation

If flux has been standing in a can for some time, stir it well. Use a small, stiff-bristle brush to coat the tube and fitting with a thin film of flux. Insert the tube into the fitting until it is hard against the socket stop and, if possible, twist the tube or fitting slightly to spread flux evenly over the two surfaces.

It is common practice for a large number of joints to be cleaned, fluxed and assembled prior to soldering, but a fluxed assembly should not be prepared more than two or three hours ahead of soldering. Under no circumstances should it be allowed to stand overnight before soldering takes place.

Heat for copper joining may be applied by torches using acetylene, propane gas, gasoline or a compressed air and gas mixture. Particularly where oxyacetylene is used, care must be taken to prevent overheating and a reducing type of flame is recommended.

Direct the flame onto the fitting, pointing toward the tube, and move it about so that a large area is uniformly heated. To determine sufficient joint heat, remove the flame periodically and touch solder wire to the fitting at the tube entry. When solder melts readily, base metal has been heated to a proper joining temperature.

Judging Proper Heat

Your guide to the right heat for soldering is this: base metal must be just hot enough to melt the solder. Too much heat will burn the flux and prevent solder from entering the joint. Excessive heat on cast fittings may cause them to crack.

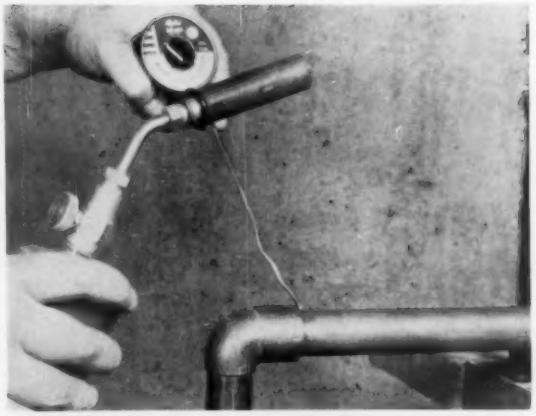
Feed solder to one or two points at the joint. Molten material will be drawn into the joint by capillary action and a ring of solder will immediately run around the exposed part of the joint. When this occurs, stop applying solder.

Provided the joint space is full, an excess of solder does not add to joint strength, and continuing to apply solder is wasteful.

On large fittings, apply solder to the lowest point and work upwards to prevent a ring of solder from encircling the flux. While solder is in the molten state, tap the fitting lightly to relieve possible flux pockets.

Testing Soldered Joints

While the joint is still hot, wipe off surplus solder and melted flux from tube and fitting. This will eliminate possible corrosive action by the flux, and also improve appearance of the parts. Allow the joint to cool for some time and do not move parts during this time.



WHEN applied solder fails to melt, heat must again be applied, taking care not to burn flux. If flux is burned, solder will not enter joint.

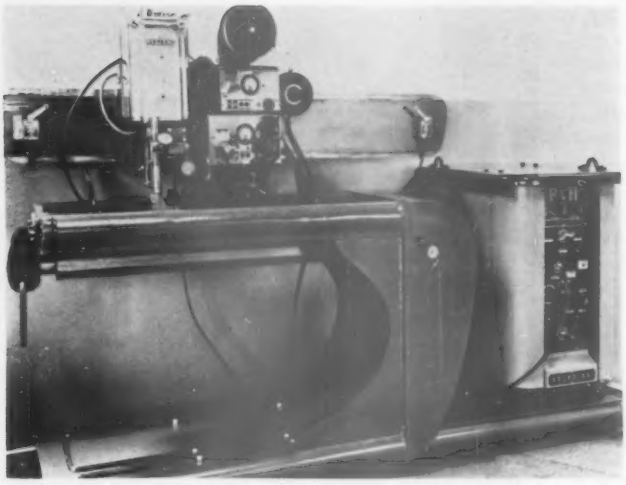
EXCESS solder and flux is removed from joint with rag or brush. After cleaning, joint should be allowed to cool naturally.

Test soldered assemblies by turning on the water. Properly-made joints will be leakproof, but should there be a leak, the tube must be drained before the joint can be resoldered. Even a few drops of water may be enough to prevent reheating the joint to a solder-melting temperature.

This soldering procedure may also be used for tube and fittings larger than 2 in., but because more metal must be heated, additional heat must be applied. Therefore, care must be taken on large fittings to avoid applying the flame too long on one spot.

Heating with a single torch in the hands of a skilled operator is entirely practical and preferred by many. Alternate methods call for two torches (requiring two operators) or single torches with two or more nozzles.

Pretinning of tube ends and fitting sockets is unnecessary. If metal has been properly cleaned and fluxed, and the solder possesses a sufficient percentage of tin, capillary action will draw all the solder needed for the joint. Pretinning may actually interfere with capillary action and thus prevent a tightly soldered joint.



THIS machine, employing special holding principle on titanium workpieces, is responsible for economical cuts firm has made in inert gas usage.

Proper tooling creates savings on inert gas in titanium welding

TENSILE TEST SPECIMEN

EDGE JOINT PREPARATION

Prior to welding, joint edges were given 90-deg bends by torch heating the edges to 700 F and bending immediately in an apron break using a 0.032-in. radius on the hold-down foot. Actual minimum radius obtained after edge cooling and relaxation was 0.046 in.

WELDING PROCEDURE

Edge joint was automatically Tig welded using 40 amp d-c straight polarity at a rate of 18 ipm. The weld panel was welded in a 40-in. cantilevered hold-down stake with a hold-down spacing of 3/16 in. The root copper backing bar had a 1/16 in. radius groove. Helium backing gas at a rate of 4 cfh was used for weld root protection.

JOINT TENSILE STRENGTH

Test Temp. (F)	Room			700		
	Average	Maximum	Minimum	Average	Maximum	Minimum
Ftu psi	94,400	98,400	97,300	38,600	38,800	38,300
% elong. 2 in.	11.5	22.0	1.0	25.1	26.0	24.5

WELDING commercially pure titanium has created problems that continually harass those who fabricate products with this material. Expensive inert gas coverage is frequently maintained in large plastic bags, through which weldors must manipulate their torches.

Even where a gas bag is not needed, inert gas is fed through oversize outlets to the top and underside of the weld area. In addition to the cost involved in gases for these complex operations, there are further expense factors entailed in work time and weld failures due to the inadvertent inclusion of substantial amounts of oxygen, nitrogen or hydrogen into the weld area.

Airline Welding & Engineering of Hawthorne, Calif., takes a position opposed to those who favor complete inert gas coverage of weld areas. The firm's case was stated by staff assistant H. L. Meredith, who maintained that "complete inert gas coverage is unnecessary when proper tooling is provided around the weld joint."

How It's Done

Airline fabricates many titanium parts for jet aircraft. One such part —welded without complete inert gas

coverage—illustrates this article.

This large cone segment is 30 in. in diameter at its widest end and 20 in. in diameter at the smaller end. Individual cone halves are cut from flat sheet (AMS 4901) and formed by roll bending.

Welding these titanium parts by the Tig (tungsten inert-gas) process is no different from welds on other corrosion-resistant materials, according to Meredith. Joints are prepared by draw-filing the square butt edges, eliminating sharp burrs which prevent close fit-up.

Deburring is followed by an acetone cleaning to remove oil and industrial dust. Edges of the two halves are then welded in a longitudinal seam welding machine.

A Practical Theory

This welding machine employs what Meredith calls his *chill-shunting hold down theory*.

A series of segmented steel fingers on both sides of the machine are tipped with precision-machined copper inserts. These fingers are operated in impulses set up when pressure is applied to toe-touch control hoses on the machine base.

The machine operator places half of the cone segment between fingers and table top, then gages straightness of position by sighting the joint edge with the center of the backing bar groove. The second half of the cone is merely slipped into the opposite side of the machine and butted against the first.

As pressure is placed on one of the two sets of control hoses, an electrical apparatus opens a pneumatic air valve. Compressed air is released by the valve into a fire hose on the side of the table top corresponding to the location of the control hose.

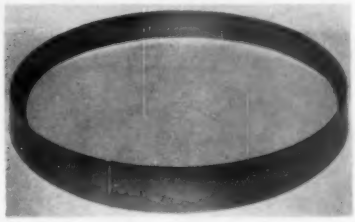
The inflating fire hose then forces the segmented hold-down fingers against the workpiece.

Each copper insert backing bar has a rectangular groove. Grooves vary in width and depth, and selection of groove type is dependent upon material thickness.

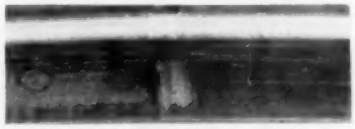
No Weld Oxidation

By selecting proper hold-down spacing (*i.e.*, the distance between tips of hold-down fingers), and proper width and depth of the backing bar groove, titanium butt joints are Tig welded successfully by Airline without the use of inert gas backing.

LEFT: Cone segment of titanium sheet was seam and spot welded by Tig process without the use of complete inert gas coverage.



TITANIUM ring, with Tig seam welds, is heated to 700 F for roll-forming operation. Results are shown below; weld remained sound through severe forming stresses.



Results at the firm's plant have shown bright welds with no signs of oxidation. The trick—if it can be called a trick—is in the selection of a slight groove depth in the backing bar. A shallow depth prevents excessive air from contacting the progressively molten and solidifying weld puddle.

Airline engineers believe the current statements regarding titanium's high affinity for oxygen, nitrogen and hydrogen to be somewhat exaggerated. According to Meredith, the improved purity of today's commercial titanium allows it to absorb small amounts of air contaminants during welding without becoming brittle.

Meredith backs up this contention by citing a paper presented before a 1953 meeting of the American Welding Society (*Effect of atmospheric contaminants on arc welds in titanium*, by Messrs. Barret and Lane).

The authors indicated that 0.10% oxygen and a like amount of nitrogen could be absorbed or put into solution with titanium without greatly endangering mechanical property requirements of the weld nugget.

Stronger Weld Joints

Through production development tests, Airline engineers have determined that such titanium joints as square butt, half-open corner and bevel-flared joints may easily be fused if the chill-shunt tooling method is used around the joint.

A fusion weld in titanium, without the addition of filler wire, will result in weld joint strengths greater than base metal. There is a slight decrease in ductility during welding and, in fact, parent metal ductility may be retained in the cast weld nugget itself.

Stainless steel, when fusion welded, will have good ductility, but will suffer a loss in ultimate and yield tensile strength.

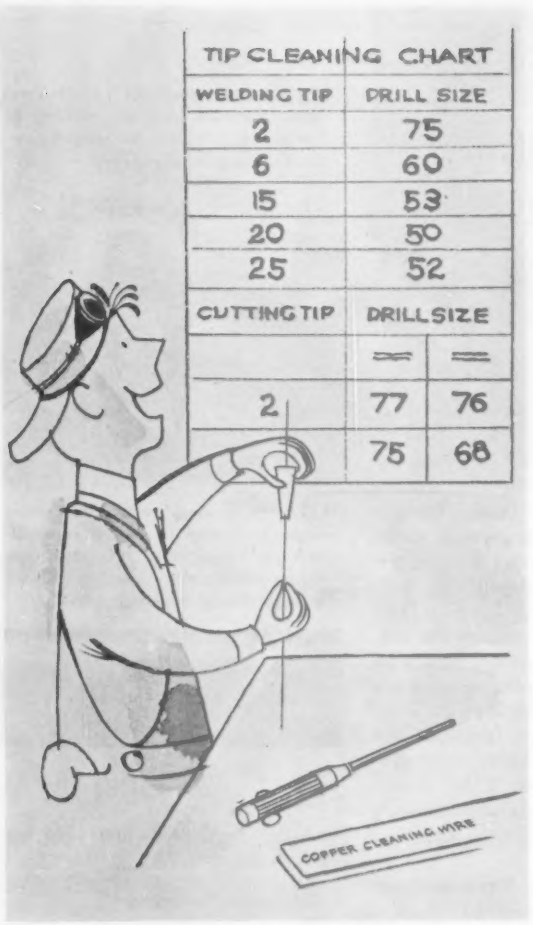
Titanium Economy

The ring pictured in this article is also AMS 4901 titanium (the same thickness as the cone segment), and it is spot welded by the Tig process. This component, however, is formed hot at 700 F. Note that the weld in the ring has taken severe rolling stresses without detriment.

The success of this type of forming is due to the fact that at 700 F, ultimate and yield strength is quite low, and ductility is exceptionally high. Micro cracks or tears do not occur at high temperatures.

The greater economy in titanium welding operations enjoyed by Airline Welding & Engineering tie in directly with recent optimistic forecasts concerning the increased use of titanium by civilian manufacturers.

Predictions for wider applications have encompassed the transportation, chemical and marine equipment industries. Greater cost of the lightweight, corrosion-resistant metal has lost much of its importance in view of the longer service life of titanium products.



For safer and more economical equipment operations, most oxyacetylene weldors and flame-cutters know that . . .

Maintenance should be a routine

DAMAGE, leakage, dirt: these are the items that cost you money whenever and wherever they occur. They are items, however, that are never found in shops where equipment maintenance is taken as seriously as any customer's job.

Keeping oxyacetylene welding and flame-cutting equipment in safe working condition can be a relatively simple task if it is done regularly. Being faithful in the care of valuable and well-made equipment is actually just another way of insuring more profitable returns on your business investment.

Soap-Water Leakage Test

The most important testing procedure—from the standpoint of both safety and economy—is that designed to locate gas leaks. It is a test that should be performed at least once every month. If equipment is subjected to continual use, more frequent testing would be a wise practice.

Clean water and a greaseless soap are the simple elements of a solution that can be brushed over gas equipment to test for leakage both before and after the equipment has been used. This solution should be applied to certain key points which are notable leak-starters.

First of the leak-starting points is the cylinder valve stem. Valves on both oxygen and acetylene tanks should be fully opened before making the soapy-water test. If leakage is discovered in the oxygen cylinder valve stem, the valve should be closed and the cylinder returned to the supplier complete with proper tag and markings.

Valve stem leaks in acetylene cylinders may possibly be adjusted. Close the valve and tighten the packing nut. A retest should then be made with the valve opened about 1½ turns.

A valve that continues to leak after this adjustment is faulty enough to warrant cylinder replacement. Move the cylinder outdoors, put a sign on it warning everyone to steer clear with cigarettes or other sources of ignition, and call your supplier immediately.

Regular Inlet Leakage

Any periodic search for possible equipment leakage should not overlook the regulator inlet connections. Naturally, first step in the test procedure at this point is

to close the cylinder valve. After disconnecting the regulator, clean and examine all regulator connections for possible damage.

If some connections are damaged, the regulator should be returned to the supplier for repairs. Cylinders should be returned, too, if connections have been marred.

Whenever a regulator has to be returned to a supplier for repairs, a test inspection should be scheduled immediately after it has been returned to the shop.

Crack the cylinder valve to blow out dust, then tightly fasten the repaired regulator to the proper cylinder. The cylinder valve should now be fully opened, and the regulator outlet can be blocked off by a thumb.

With a working pressure of 10 psi on an acetylene regulator or 25 psi on an oxygen regulator, any leakage between regulator cap and body can be noted. If leakage does persist, return the regulator once more to the supplier.

Leakage at Hose Connections

A hose can be disconnected for a test when the regulator is shut off. The connection should then be cleaned and examined. Damaged hose base connections should be replaced.

After reconnecting the hose, tighten securely and turn on the regulator. Should the damage exist in regulator or torch connections, these parts should be returned to the supplier.

Best and simplest of the hose tests, of course, is immersion in water. A new hose—or a new section spliced-in with a coupling—is the only safe remedy for hose leakage. Tape should never be used, even for an emergency repair.

Testing Torch Valves

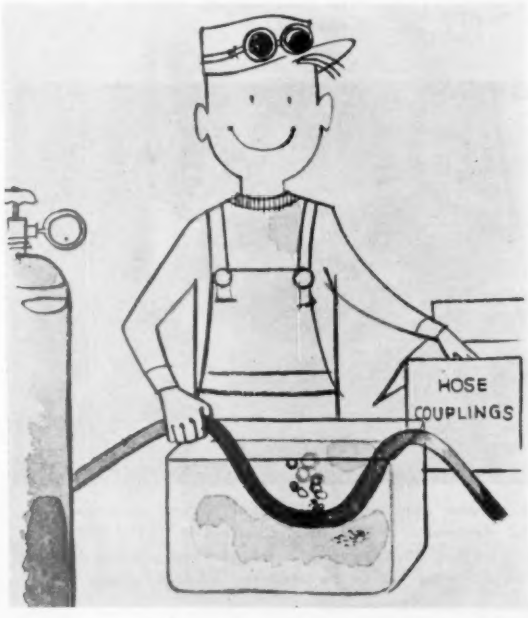
Next stop on the rounds of leakage-point tests is the torch valve stem. If a leak exists, it may possibly be stopped when the packing nut is tightened. Failing this, valve packing washers can be replaced.

—Courtesy Linde Air Products Co.

Torch valve seats can be tested by immersing the torch tip in water. Bubbling will indicate leakage through one or more of the torch valves.

Procedures outlined in various gas manuals will help you determine the faulty valve. When this fact is known, shut off oxygen or acetylene at the regulator. Dismantle the valve and clean the valve end and the seat of the valve body.

Any damaged parts, of course, should be returned to the supplier. A dirty, but undamaged, valve can be reassembled after cleaning, turned on and off a few times, and tightened securely into place.



Check Tips Frequently

Welding and cutting tips become clogged in the course of normal use, and should regularly be cleaned by hand. When performing this cleaning operation, only cleaning drills of the correct size—or properly-sized copper or soft brass wire—should be used.

The test points covered in this article—and in the various gas manuals—are those which can and should be applied by every torch operator who wants to perform safe and economical operations. Problem areas not covered here or in the manuals require more expert handling. *They should not be attempted in the shop;* send them, instead, to your supplier.

Your oxyacetylene welding and cutting equipment—like your automobile—is valuable property that needs the best of care to function in the best possible manner. Test it regularly, and watch for the signs that point to danger, or that will lead to slower, more costly operations.

"Piggy-back" transport

FORK-lift truck mounts last of three vans on railroad flat car. When fork is removed, latching pin will enter anchor mechanism on car to hold van in place.

By a Staff Member

PIGGY-BACK movements of truck trailers by rail have become a familiar sight on many railroads in the past several years. One of the newer systems involves wheel-less vans which are locked onto the bed of a rail flat car or to a flatbed truck.

Key to the whole "Mobilvan" system is the "Mobilock" latching mechanism, which is fabricated for the most part by welding. Another component, known as the "Mobilplank" anchor mechanism, is also welded.

Originator of this piggy-back innovation is the Clark Equipment Co., Buchanan, Mich. Fruehauf Trailer Co., Detroit, manufactures and distributes the vans for Clark, which furnishes the fabricated locking and anchor mechanisms. These components, depicted in the accompanying illustrations, are made for Clark by Kalamazoo (Mich.) Mfg. Co.

In operation, the vans are loaded and unloaded through use of fork-lift and straddle trucks. Capacity of one type of van is 10 tons. Three vans of this size are loaded on a railroad flat car, two on a truck.

The latching device is contained in an assembly consisting of two castings welded to a steel channel. Into each latching device goes two welded A-frame assemblies, springs, bellcrank and pivot pin.

An A-frame assembly has pins at each end that lock into hinges when forks of the lift-truck are pulled out of the van's latching mechanism. Catch and release are effected by forks pushing against round bar sections of the A-frame legs which protrude from the van on either side of the channel.

BELLCRANK and pivot pin are installed in welded channel assembly. Newest assembly type has two-pin locking device. Anchor plate fits into spade-shaped casting at end of channel.

A-FRAME and spring have been connected to bellcrank and frame. Worker here installs drive pin in bellcrank. Locking mechanism is activated by fork of lift truck.

CHANNEL of anchor mechanism is welded to end castings with 3/16-in. E6012 electrodes at 200 amp. Channel is SAE 1020 steel, and is mounted on bed of rail car or truck. Anchor plate is hinged and retractable, allowing car to be used for other hauling.

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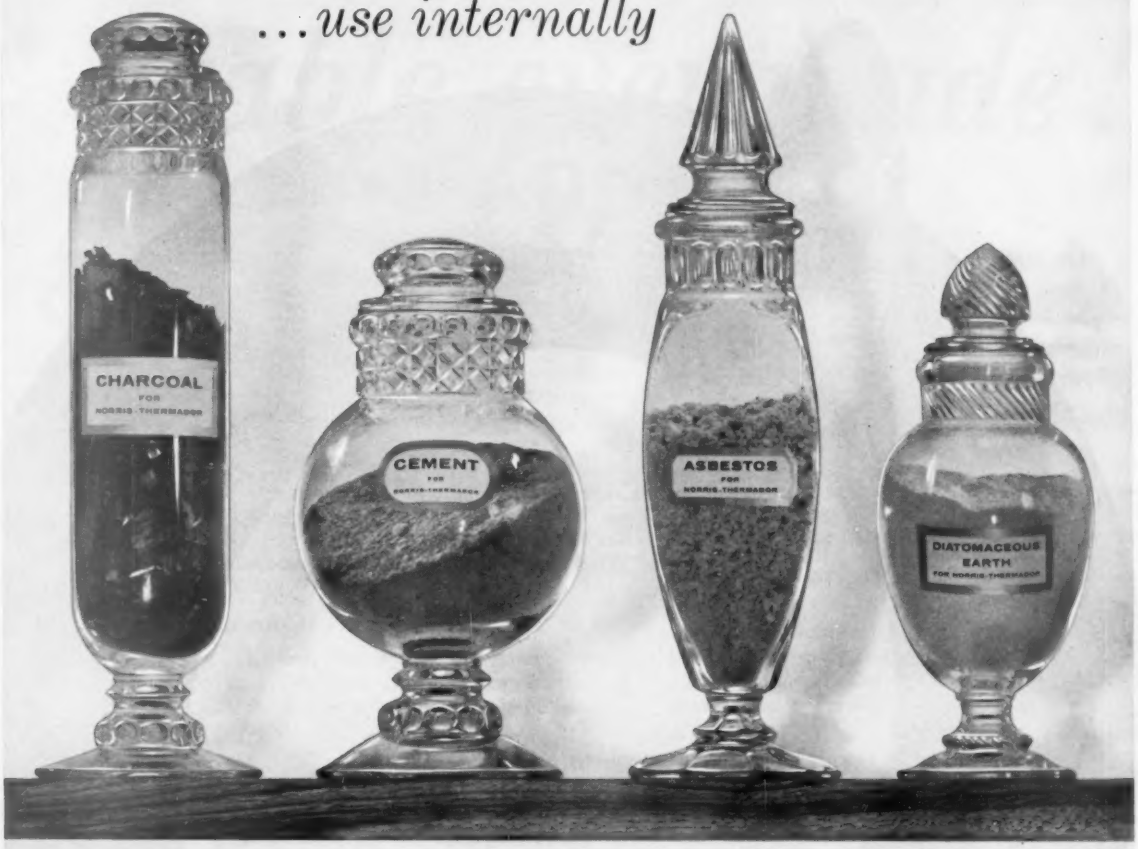

3-1061

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Tough gas rubber jacket resists abrasion, acids, sunlight and heat.

Takes good connections . . .

Both mechanical connections and soldered connections are simple to make with aluminum welding cable. You can easily connect aluminum to aluminum, or aluminum to your old copper cables.

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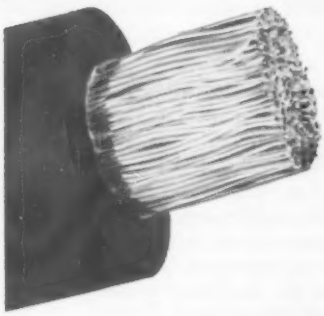
The favorable price of aluminum, when compared to copper, provides important economies. And you continue saving money even when you specify aluminum larger than copper to offset its slightly lower current carrying capacity.

Install aluminum whip-leads now!

Until your copper cables come up for replacement, your existing copper lines can easily be equipped with light, flexible aluminum whip-leads by means of simple mechanical connections. Weldors can tell the difference immediately! And as your copper cables are ready for replacement, you can take full advantage of aluminum for the entire line.



For complete information on new aluminum welding cable, contact your welding equipment manufacturer or your nearby welding supply distributor. Aluminum welding cable is produced for equipment manufacturers by Kaiser Aluminum at the Company's Newark, Ohio wire and cable mill.

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At your request, we will be glad to send you our informative booklet, "New Advantages in Arc Welding Cable with Aluminum Welding Cable." Write to Kaiser Aluminum & Chemical Sales, Inc. *Executive Office,* Kaiser Bldg., Oakland 12, California; *General Sales Office,* Palmolive Bldg., Chicago 11, Illinois.

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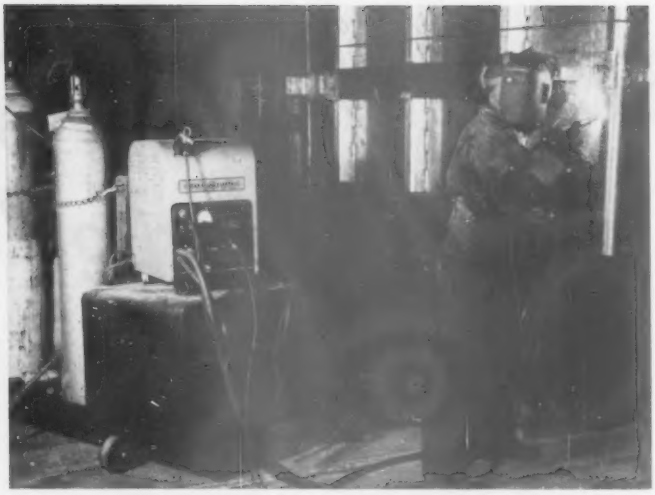

MIG gun with argon shielding gas is used by weldor to complete joining of end sheet to corner post on new aluminum rail car.

WELDED gondola cars like this will carry greater amounts of bauxite ore than steel cars now in use. Cars are unloaded by rotary dumper.

Welded rail cars for . . .

13 tough miles

THE BAUXITE hauled from Kaiser Aluminum & Chemical Corp.'s Jamaica mines to the island's southern coast soon will be making the journey in all-welded aluminum gondola cars.

Fabricated by the Mig (metal inert-gas) process, the new railroad cars travel the company's 13 miles of railroad tracks with a payload 20% greater than that now carried by conventional gondola cars.

A highly weldable aluminum alloy (AA 5086) was used in car fabrication, and this alloy was provided in extruded structural shapes. Aluminum was the choice because of its high corrosion resistance, ease of maintenance and stress resistance.

Drainage Holes

Simple jigs were used in body construction. Four 7/16-in.-thick aluminum plates were butt welded to form the car floor. Collection of moisture within the car body will be prevented by ¾-in. drain holes in the floor plates.

Continuous sides were formed for each car from two ⅜-in.-thick aluminum plates Mig welded together. Top side rails and side posts are single extruded sections of 5086 alloy. The side posts fit into top side rails and are welded to the exterior of side sheets on 3-ft centers.

Heavy Reinforcement

To give the cars stiffness needed during rotary dumping operations, the web of the T-shaped side posts is taper-cut from a 12-in. extruded I-beam, and the flange is reinforced with a 7/16 by 4-in. reinforcing plate. The outside of the post is thus flush with the top side rail. Side sheets are sloped outward at a 2-deg angle to facilitate dumping.

Extruded aluminum side and end sill angles, 6 by 4 in., are Mig welded to sides, ends and floors of each car body. Three extruded, channel-shaped vertical posts are welded to end sheets. These end sheets are further reinforced by two aluminum straps, ½ by 6 in., positioned horizontally and welded to end posts and car corners.

The only non-welding operation takes place when car body is joined to steel underframe. Hot-driven rivets are used in this final fabrication step. Zinc chromate paint on aluminum and red lead on steel form the insulation. Car cement is sprayed over the entire underframe.

An aluminum gusset is welded to the bottom of each end post and fitted around the diaphragm to effect a rigid section at floor level.

Carrying six 14-ton truckloads of bauxite each, the new aluminum cars better their steel counterparts by one truckload each. The design which permits this increased lading does not exceed AAR limitations.

Its spark is first, then its bite

(Wheel guard removed to reveal grinding action.)

PHOTOGRAPHED AT CUSTOM METAL PRODUCTS CORP., DETROIT, MICH.

The portable grinding of weld beads demands a wheel that can take it. This B7 Bond Resinoid Cup Wheel, for instance, is built to chew through the heaviest welds you'll find. In fact, for all your rough grinding and snagging on castings and forgings, whether steel or non-ferrous, your best bet is a portable wheel by CARBORUNDUM. They're made in both aluminum oxide and silicon carbide, specially bonded to give maximum strength and safety even on severest applications. And they maintain their high initial rate of cut for the life of the wheel...give highest production at lowest abrasive cost. A good man to see is your CARBORUNDUM Distributor or salesman. He'll recommend the best wheel for every portable grinding job in your shop. Call him today, or write The Carborundum Company, Niagara Falls, New York. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ontario.

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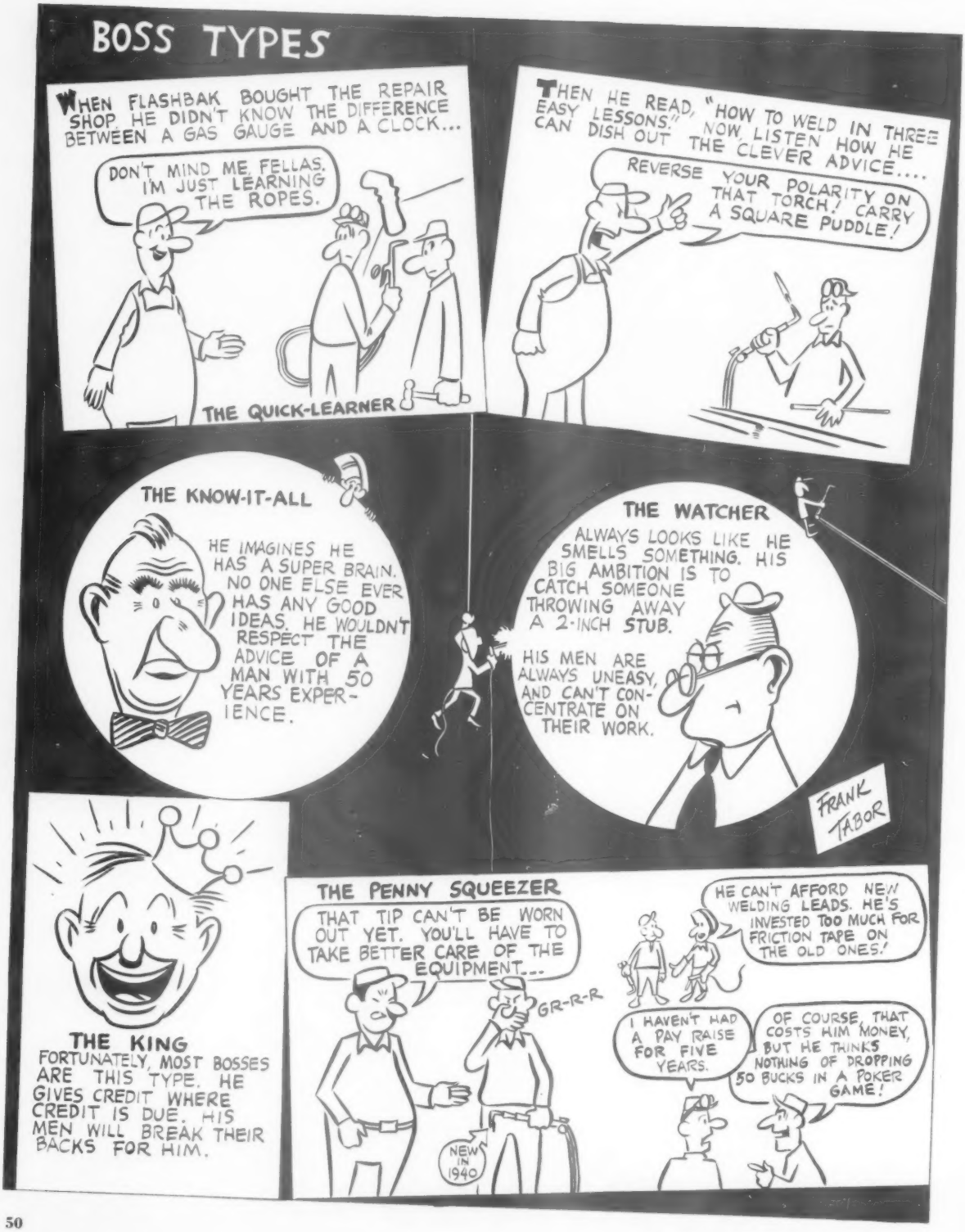
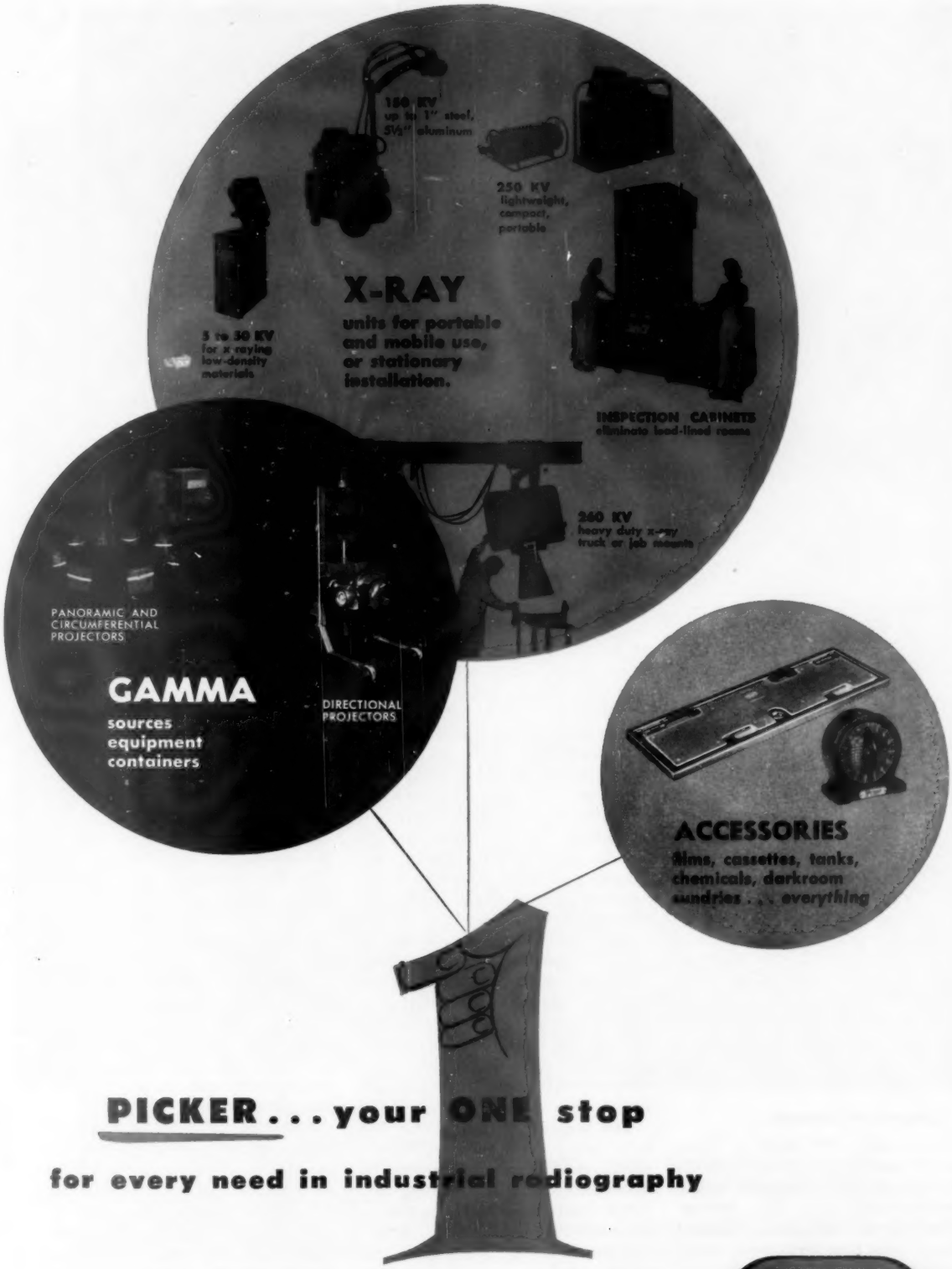
A WELDOR'S WOES


BOSS TYPES
WHEN FLASHBAK BOUGHT THE REPAIR SHOP, HE DIDN'T KNOW THE DIFFERENCE BETWEEN A GAS GAUGE AND A CLOCK...
DON'T MIND ME, FELLAS. I'M JUST LEARNING THE ROPES.
THE QUICK-LEARNER
THEN HE READ, "HOW TO WELD IN THREE EASY LESSONS." NOW, LISTEN HOW HE CAN DISH OUT THE CLEVER ADVICE....
REVERSE YOUR POLARITY ON THAT TORCH! CARRY A SQUARE PUDDLE!
THE KNOW-IT-ALL
HE IMAGINES HE HAS A SUPER BRAIN. NO ONE ELSE EVER HAS ANY GOOD IDEAS. HE WOULDN'T RESPECT THE ADVICE OF A MAN WITH 50 YEARS EXPERIENCE.
THE WATCHER
ALWAYS LOOKS LIKE HE SMELLS SOMETHING. HIS BIG AMBITION IS TO CATCH SOMEONE THROWING AWAY A 2-INCH STUB.
HIS MEN ARE ALWAYS UNEASY, AND CAN'T CONCENTRATE ON THEIR WORK.
FRANK TABOR
THE KING
FORTUNATELY, MOST BOSSES ARE THIS TYPE. HE GIVES CREDIT WHERE CREDIT IS DUE. HIS MEN WILL BREAK THEIR BACKS FOR HIM.
THE PENNY SQUEEZER
THAT TIP CAN'T BE WORN OUT YET. YOU'LL HAVE TO TAKE BETTER CARE OF THE EQUIPMENT...
GR-R-R
NEW IN 1940
HE CAN'T AFFORD NEW WELDING LEADS. HE'S INVESTED TOO MUCH FOR FRICTION TAPE ON THE OLD ONES!
I HAVEN'T HAD A PAY RAISE FOR FIVE YEARS.
OF COURSE, THAT COSTS HIM MONEY, BUT HE THINKS NOTHING OF DROPPING 50 BUCKS IN A POKER GAME!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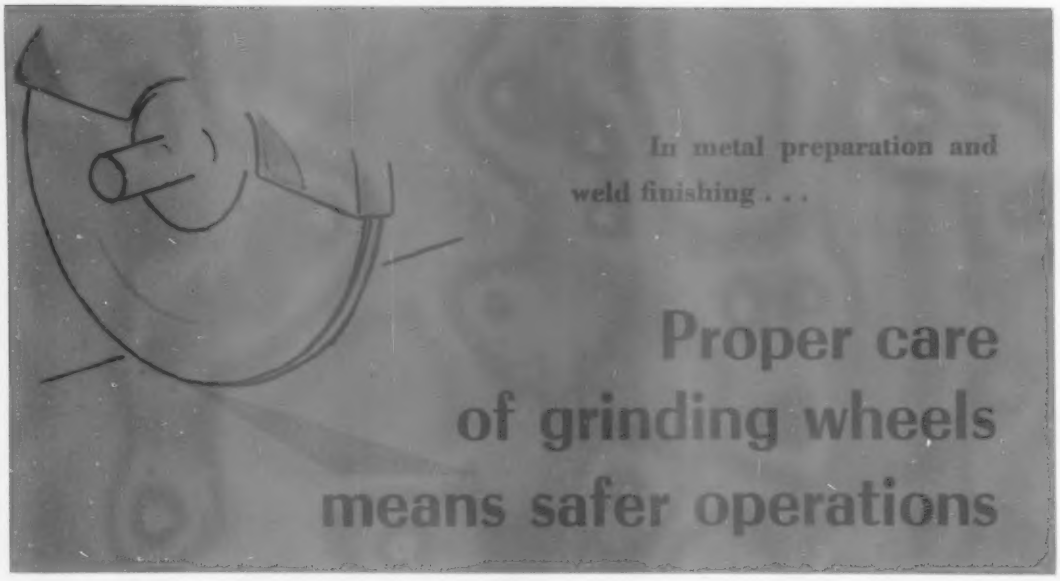

By Ralph N. S. Merritt
Product Safety Engineer
Norton Co.
Worcester, Mass.

GRINDING is one of the safest operations in the field of metal preparation and weld finishing. Hundreds of thousands of grinding wheels are in daily use with only an occasional accidental breakage. Many other materials and operations associated with present day production are far more dangerous than grinding.

To do a job efficiently, hardness or bonding strength of a grinding wheel must be controlled by the operation which it performs. This arbitrary limitation in the strength of wheel bonding means the wheel will have a structure (arrangement of abrasives, bond and pores) which must be treated with understanding.

Controlled Strength

Technically, the bonding agent must be just strong enough to retain the exposed layer of abrasive cutting particles until they have become dulled beyond further use. The bond "posts" must then break away under pressure of increased drag to free dull grains and present a new layer of sharp grains.

This self-dressing process is progressive and continuous. If the bond surrounding the grains and connecting them were so thick and strong that the bond failed to break away under normal grinding pressure, the wheel would no longer be an efficient, stock-removing tool.

The need for limitation of wheel grade or hardness has been responsible for development of grinding wheel structures of carefully controlled strengths for more critical grinding operations. Precision tool and die grinding, and surface grinding, for example, places a strength limit on grinding wheels which necessitates careful use.

The excellent safety record of grinding wheels is no mere accident. It is the result of 60 years of research, exhaustive tests by wheel manufacturers, experience records and an extensive and ever-continuing program of education for machine operators in proper use and care of grinding wheels.

This program, in turn, has resulted in a Safety Code published by the American Standards Association and sponsored jointly by the Grinding Wheel Institute and the International Association of Governmental Labor Officials. It is the "Safety Bible" of grinding and the basis of most state codes.

If grinding wheels are used as directed by the ASA Code, accidents and injuries *can* be prevented. Every operator should be familiar with provisions of the Code.

Safety Regulators

Three major agencies are responsible for maintaining conditions to insure safe operation of grinding wheels. To achieve this objective, all three must co-ordinate their efforts:

1. The grinding wheel manufacturer;

2. The grinding machine manufacturer;

3. The grinding machine operator and his employer.

The grinding wheel must be properly made, tested and packed for shipment by the wheel manufacturer. Grinding wheels are carefully inspected for a variety of physical characteristics, and are also speed-tested sufficiently above operating speed to provide an ample safety factor. Wheels are then carefully packed for safe shipment.

Maximum safe speed of each wheel established by the manufacturer and shown on the wheel or wheel tag must never be exceeded for any reason. *This is extremely important.*

The machine builder must furnish proper and safe equipment for the operator to use. Since today's machines invariably are designed in accordance with the ASA Safety Code, they usually can be depended upon to fulfill all safety requirements un-

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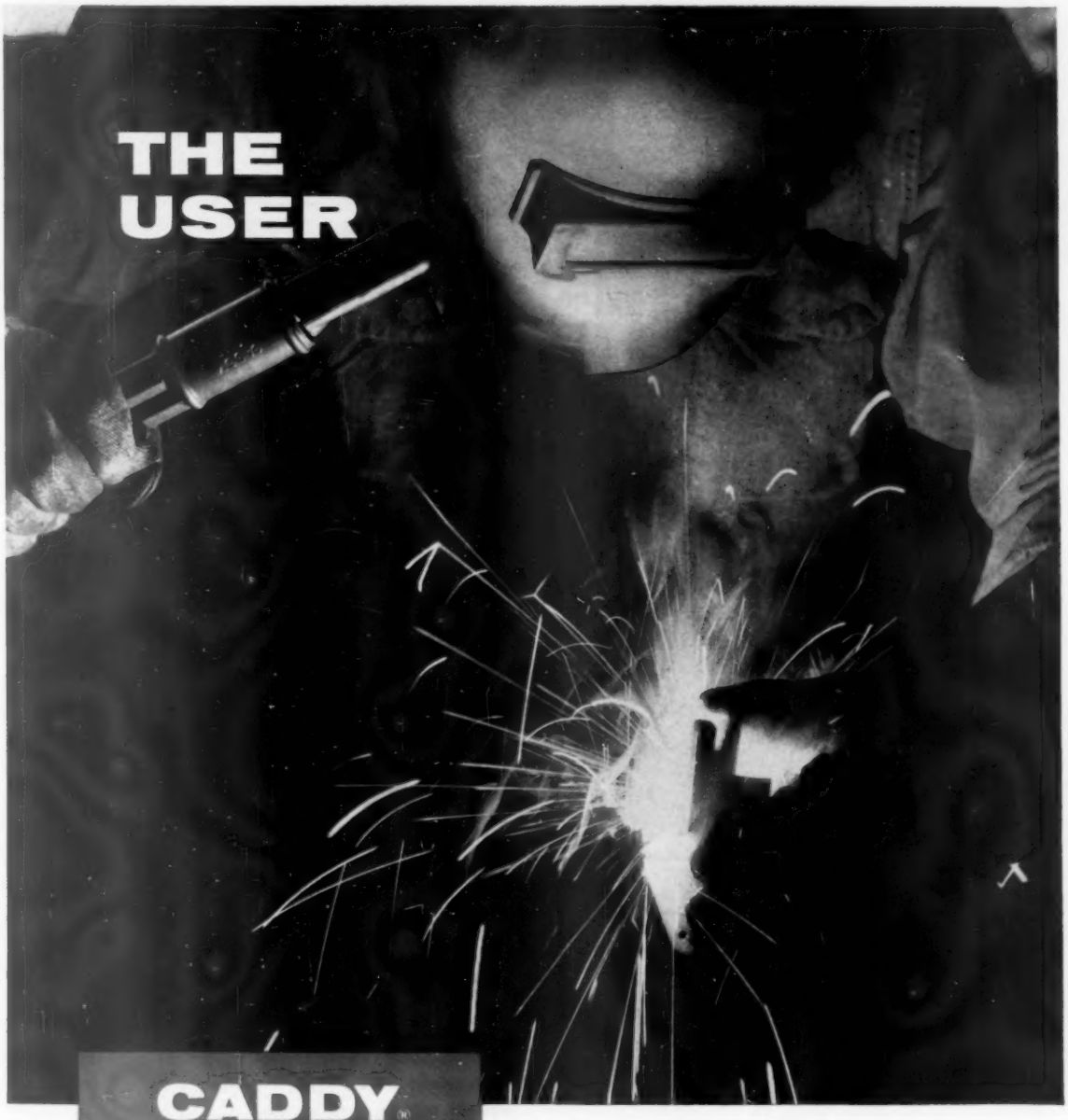

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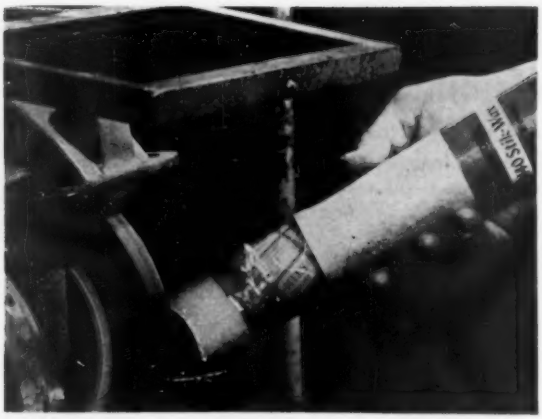
IMPROPER procedure is being followed by this workman in operating a grinding wheel without a guard. Use of grinding wheels can be safe when safety steps are followed.



EVEN during polishing operations, safety comes first. Shield above the wheel will keep abrasive particles from striking operator's face. (Polishing wax is being applied here.)

less alterations have subsequently been made by the user.

User's Obligations

The grinding wheel user is a very important link in the safety chain; his duties and responsibilities are many. They include the following:

The user should inspect shipments on receipt to be sure wheels have not been damaged in transit. Each wheel should be carefully removed from the container and inspected visually for cracks or other defects.

To detect possible cracks which may not be visible, use the "ring test." If the wheel is sound, it will give a clear, musical ring when tapped with a non-metallic implement like the handle of a screw driver. This test should be repeated when mounting the wheel in a machine.

Suitable safe-storage facilities in a dry place should be provided until wheels are used. For storing straight wheels upright or on their face, racks of approved design should be used.

Cut-off and other thin, organically-bonded wheels should be stacked on their sides on a flat surface to prevent warpage. If suitable storage facilities are not immediately available, wheels should be left temporarily in their original shipping container. A section in the ASA Safety Code gives details on proper wheel storage and rack construction.

Mounting Is Crucial

Approximately one-third of all grinding wheel failures can be traced directly to improper mounting, as a result of which severe internal strains are introduced into the wheel. *This is the largest single cause of wheel failure.*

There are a number of important points to check constantly on equipment. The arbor or pilot must be the correct standard size within close limits to allow the wheel to just slip over it, without excessive clearance or play, and without forcing or "wringing."

Design of flanges and their condition are also important. They must be at least one-third the diameter of the wheel (if a small hole is used), and designed with proper thickness and relief to comply with the ASA Code. If flanges lack constant diameter and proper relief to allow uniform peripheral pressure when the nut is tightened, dangerous cross-bending strains are set up in the wheels.

Compressible paper washers or blotters will further help to distribute clamping pressure uniformly, particularly where wheels are of a relatively coarse grit size.

Check Flanges

Flanges should be checked frequently during use. Warping, dishing or excessive wear can cause dangerous mounting pressures to be concentrated close to the hole—the weakest zone of a rotating wheel.

Extra care must be given equipment and mounting procedure when wheels with relatively large holes are used, as on cylindrical, thread-grinding and other precision grinding machines employing sleeve-type mountings.

Before mounting the wheel, an operator should know the exact speed of the machine spindle and check it against maximum operating speed of the wheel as specified by the manufacturer. This is particularly important when variable-speed grinders are used, when changing wheels from one type of bond to another, and when changing to softer-grade wheels which may be much weaker.

Mounting Procedure

Before mounting, a new wheel should again be carefully inspected for cracks, using the ring test, to be sure it was not damaged in handling. An operator should also check spindle and flanges to be sure they are clean and not nicked or warped.

A single, new blotter slightly larger than the flange should be used on each side of the wheel. The nut should be tightened snugly, but not excessively.

Actually, driving pressure required, once the wheel has reached its normal operating speed, is fairly low. Excessive tightening can strain the wheel and even warp flanges sufficiently to cause wheel breakage.

All grinding operations should be carefully guarded to protect the operator from accidental breakage. The ASA Code provides complete technical details on suitable guards for all types of grinding operations.

Starting the Machine

The careful operator will first adjust the guard for size of wheel and secure the cover. Then, standing out of line of the newly-mounted wheel, he will start the machine, allowing it

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ALUMINUM COMPANY OF AMERICA

TAPPING with non-metallic instrument—in this case a screwdriver handle—should make grinding wheel give clear ring. Ring test will often uncover cracks.

to operate for a full minute before approaching the wheel.

Breakages resulting from damaged wheels, faulty mounting or overspeed usually occur right after starting up the machine.

Now, the operator need only observe normal rules of grinding, such as moderate feed with minimum side pressure. Excessive heating or loading of the wheel face is a sign that grain and grade specification probably is not right for the job.

It cannot be emphasized too strongly that all grinding operations must be properly guarded to protect the operator from accidental wheel breakage. This requirement must be particularly enforced on portable wheel grinders.

A major portion of personal injury accidents results from portable grinders used abusively without guards. Guards to fit any type of portable grinder and type of grinding wheel are readily obtainable today.

Investigate Breakage

A grinding wheel should never break except from inadvertent misuse. However, even a so-called harmless breakage should promptly be investigated by the plant safety engineer to determine its cause. Proper steps should then be taken to remedy the trouble and prevent more serious breakage later.

Equipment and conditions should be checked to establish the cause of breakage. Too often, we find that a personal injury accident occurs after a previous similar breakage which had been ignored.

Grinding is a safe operation. Safety is virtually assured if the ASA Safety Code is observed in all instances. If the operator and other personnel are instructed in various safety rules concerning inspection of grinding wheels, safe speeds, safe mounting equipment and procedure, as well as safe operating technique, wheel breakages will be reduced to the vanishing point.

Personal injuries and damage from even occasional breakages can be prevented if adequate, approved guards are used on all grinding operations. These rare breakages should always be carefully investigated to ascertain the causes and then take steps to correct them.

——"Haven't you got any electrodes that aren't so sticky?"

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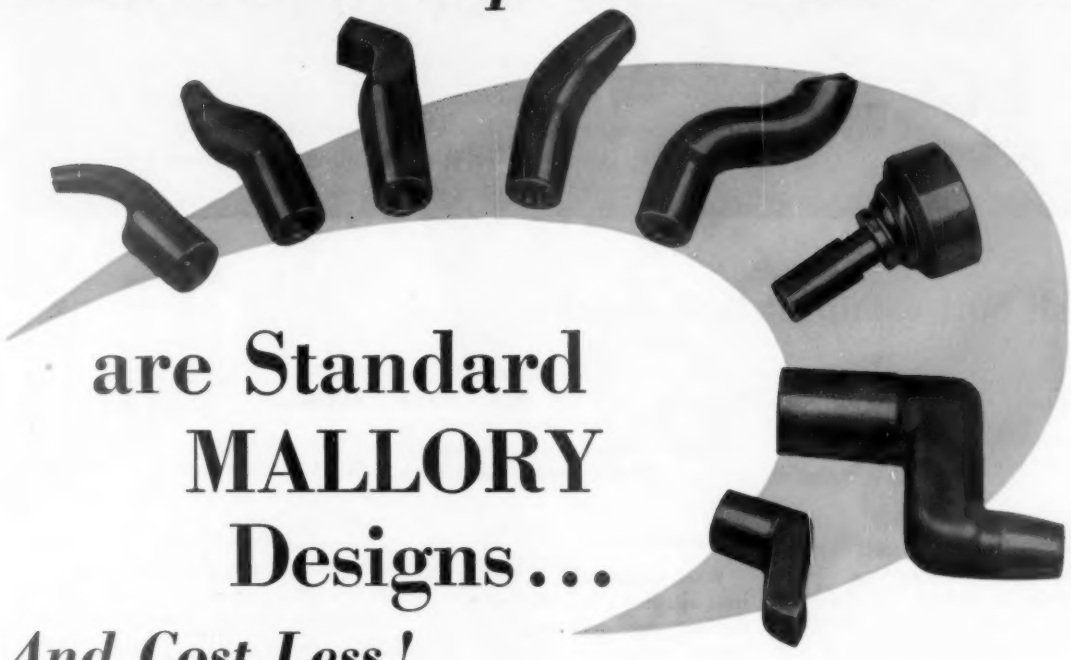

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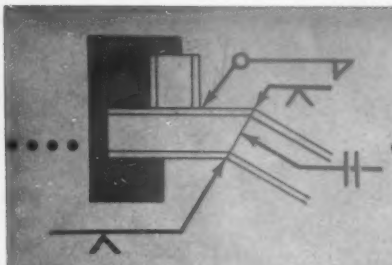


the welding clinic

Here you may find the solution to your welding problems, whether they concern design, production, construction or maintenance welding. Submit your questions for answering on this page.

Flash butt vs. upset butt welding

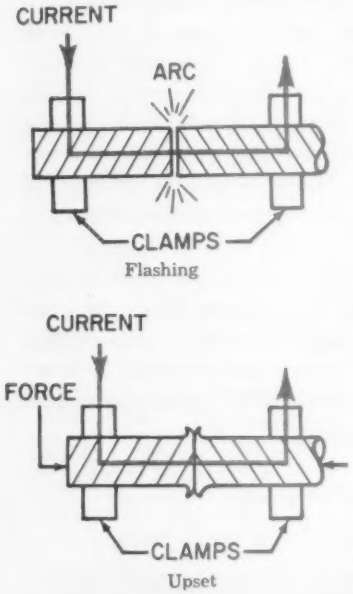
Question:

Please explain the principles of the flash butt welding process.

Answer:

The resistance welding process known as flash butt welding is used principally in end-joining such materials as rods, bars, fittings and forgings. It is also used to join tubes, and the process results in welds of very high strength.

As indicated in the accompanying diagram, provided by Sciaky Bros., of Chicago, the pieces to be welded can actually be clamped by electrodes. Pressure between abutting edges is light before current is introduced.



Flash butt welding

Flashing results when current is turned on and a high degree of heat is generated. Increasing pressure is applied to the ends of the workpieces as metal is burned away, maintaining the arc.

Upset Action

When inner faces of abutting edges have attained proper temperature under this uniform flashing action, final joining pressure is applied and current is turned off.

The upset metal which results from the ultimate heavy pressure on the workpieces contains many of the impurities formed during flashing (*i.e.*, oxides and slag). It is pure base metal, then, which constitutes the weld.

The fact that base material forms the weld is the principal reason for the estimated 100% strength factor in flash butt welding. The process offers further advantages in that no rod, gas or flux is needed, and power demand and consumption are low.

The flash butt welding process is finding increasing industrial applications because of its speed. It can be applied quite easily to dissimilar metals with varying melting temperatures.

Flash butt welding machines which utilize the principle of clamping electrodes eliminate tedious fastening procedures and usually allow operation by a single, nonskilled operator. Heat produced by the flash is localized, cutting distortion, and special weld preparation is usually unnecessary.

Question:

In what way does the upset butt welding process differ from flash butt welding?

Answer:

Although both processes can be applied to similar parts, upset butt welding differs initially from flash butt welding in that parts placed in the former machine are brought together under relatively heavy pressure.

Another significant difference is found in the fact that no arcing occurs at any time in upset butt welding. The passage of current through the workpieces is the only factor which develops the heat necessary for welding.

One Limitation

The upset butt welding process is used almost exclusively in joining ferrous metals. Also, parts can be joined more successfully by this process if they are equal in sectional area and resistance.

According to P. R. Mallory & Co., Inc., Indianapolis, Ind., the critical heat balance which must be maintained for good upset butt welds can be achieved if these two simple rules are observed:

(a) When metals to be welded are similar in composition but unequal in area, the part having the larger area should project farther from the clamping die than the other piece.

(b) When welding dissimilar metals or metals of dissimilar cross-sectional area, the area of contact should be restricted. Contacting faces, however, *must* be parallel for best upset butt welding results.

The most apparent advantage to be found in using the upset butt welding process is its *cleanliness*. Flash spatter and ragged extrusions are almost never encountered. Smooth, symmetrical upset areas are a general rule.

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BETTER AND MORE PROJECTION WELDS through more uniform distribution of welding current.

PERMITS WELDING NON-FERROUS METALS. Reduced "spitting" at electrodes improves appearance of aluminum and other non-ferrous welds—extends electrode life.

DESIGN FEATURES

Matched Enclosures. Slope Control enclosure matches Square D Non-Synchronous Welder Controller (Nema N2), shown at right. Also matches individual Square D welding timer or contactor enclosures.

Simplified Circuit, standard components, and heavy-duty construction.

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Welded joints and other structural areas are being thoroughly inspected by . . .

X-rays — watchdog of the aircraft industry

AiResearch Mfg. Co.

THE KNOWLEDGE that over a dozen major airlines and some aircraft manufacturers are making regular use of X-ray equipment in routine airplane maintenance would scarcely surprise anyone today. Yet, it was only a scant 20 years ago that this thorough inspection tool was proposed for its present role in the aircraft industry.

World War II seemed to nullify the growth of X-ray inspection as a maintenance factor, but it gave radiographic inspection of welds during aircraft manufacture a decided shot in the arm.

Acceptance of this relatively new, nondestructive weld inspection tool following the war was slow. It gained impetus, however, in 1953 when Lockheed Aircraft Co. released a highly favorable report detailing experiences with portable and stationary X-ray units on aircraft in service.

Portable Units

This report was complemented by the successful results achieved when Douglas Aircraft Co. intensively employed X-ray units during manufacture of both military and commercial aircraft.

An obvious deterrent to more rapid acceptance of radiographic inspection in the past was the size and weight of X-ray units then available. It wasn't until 1946 that the Danish firm of Carl Drenck produced the first truly portable unit. This machine contained a high-tension transformer and X-ray tube in one tube-head tank.

Today, virtually all of the firms using radiography as a manufacturing or maintenance inspection tool employ portable X-ray units wherever possible. These small machines, when they possess a fine focal spot, give high-quality results on structural welds while reducing handling costs and cutting positioning time.

The highly important task of selecting personnel to operate radiographic inspection units has generally been conducted within the regular inspection staffs of those firms using X-rays. This selection method is based on the almost-indisputable hypothesis that it is more economical to train an aircraft engineer to make and interpret radiographs than it is to train a radiographer to thoroughly understand aircraft structures.

Training programs conducted by airlines and aircraft manufacturers usually are done on the job, and assistance is often given by suppliers of the X-ray equipment.

Once they learn the basic principles of radiography in the laboratory, students will graduate to work on the actual aircraft structure.

A major portion of this article is based on a paper presented by E. W. Kowol before a meeting of the Society of Licensed Aircraft Engineers in England.

Areas Inspected

Many factors influence the use of radiography in aircraft maintenance. Among the most important of these are climatic conditions, aircraft type and age, and length of service of the aircraft.

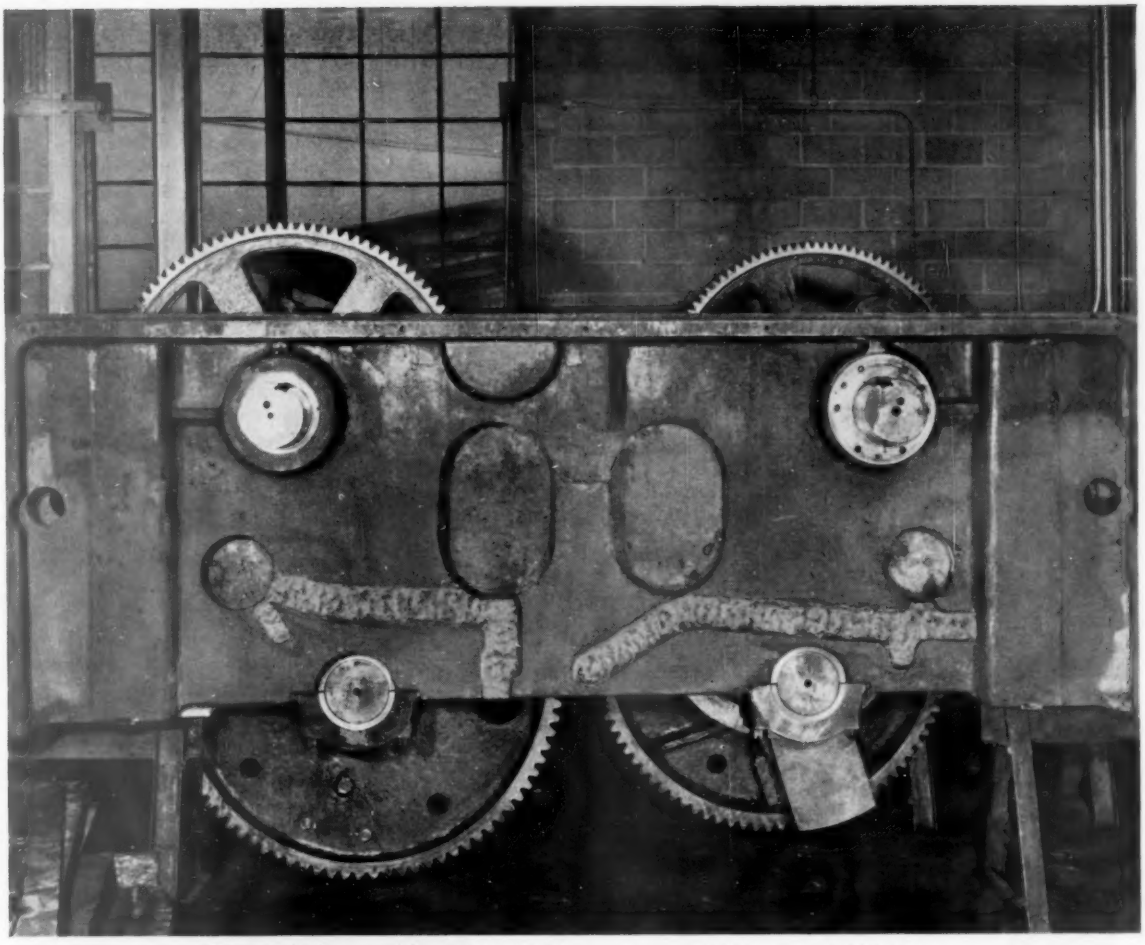
Areas inspected by X-ray teams generally are those which cannot be visually inspected. X-ray units also are used on structural areas which *could* be visually inspected only if a part of the structure were disassembled.

Three broad categories of work are undertaken by radiographic inspectors: routine structural maintenance; emergency inspection, and inspection of damaged aircraft.

For Clear Definition

Detection of weld cracks, buckling, misalignment, or the loosening of rivets are just some of the many structural weaknesses which may be uncovered by X-ray units during routine maintenance inspection. Blind areas throughout the wings, fuselage and tail assembly are thoroughly inspected with portable units.

To obtain clear definition—and thereby uncover even the finest cracks



Two of the braze welds made in this big press crown with ANACONDA-997 (Low Fuming) Bronze Rod. All four cast-iron partitions in the crown were repaired.

After other repairs failed, Braze Welding with Anaconda Rod restored this iron press crown

When this 16-ton crown of a double-action press first failed, it was repaired by electric arc-welding using a high-strength nonferrous electrode. This joint failed.

The Punch Press Repair Corporation of Ferndale, Mich., cut out the old welds and braze welded all four of the cast-iron partitions in the crown, using a total of 800 pounds of 3/8" ANACONDA-997 (Low Fuming) Bronze Welding Rod.

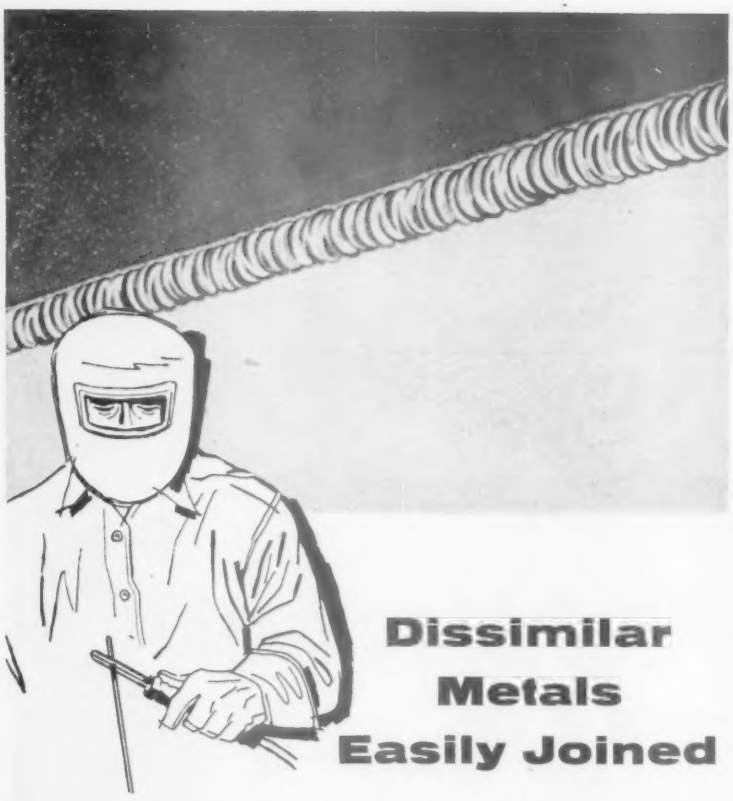
Its useful life extended, the press is back in active service at the plant of a large tool and die firm in Detroit.

ANACONDA-997 (Low Fuming) Bronze is a superior welding rod used to join gray and malleable cast iron, steel, and copper alloys by the oxyacetylene process. It is one of a broad line of Anaconda Welding Rods that are finding increasing applications in production and repair welding. Anaconda Welding Rods are sold by distributors of welding equipment everywhere.

See your Anaconda distributor or write: The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 84109

ANACONDA® WELDING RODS

Sold by distributors of welding equipment everywhere



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AMPCO-TRODE* 10 ELECTRODES

Ampco-Trode 10 electrodes give you strong, crack-free welds — even when used to join dissimilar metals, such as cast iron to steel, bronze to steel, etc.

Difficult metals are joined faster and better too. Ampco-Trode 10 electrodes are designed for joining iron-base metals and alloys, i.e., malleable iron, cast iron, manganese steel, tool steel, as well as copper- and nickel-alloys.

You get the advantages of versatility with Ampco-Trode 10 electrodes. You make intermediate hardness (130-150 BHN) overlays and inlays with excellent bearing qualities and high resistance to all forms of wear. The deposits also resist corrosion from salt water, acids, mild alkalies.

Order Ampco-Trode 10 from your Ampco distributor.

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W-139

—X-ray units must be positioned exactly. This critical aspect of inspection presents many problems in confined areas. Also, of course, any component which may obscure a radiographic picture must be avoided.

Fuel tanks, for instance, must be emptied before X-rays can be made of fuel tank areas. There is a high lead content in aviation fuel which presents a barrier to radiographic inspection.

In addition to its ultimate value as a flaw detector, radiography frequently determines repair programs for some airlines. A complete X-ray of all vital structural areas will indicate to technicians those spots which demand immediate care.

Other airlines have set up a consistent plan for periodic radiographic inspection of the same areas so that at every major overhaul (which may be at the end of 1,500 or 2,000 flying hours), results are readily available. Routine inspection such as this is an excellent method for uncovering the indefatigable enemy of aircraft—corrosion.

Difficult to Spot

One of the most difficult flaws to detect—even with the best X-ray apparatus—is corrosion. Even under ideal exposure conditions with good equipment, only rather severely corroded areas are readily detectable.

Emergency inspection—or trouble-shooting—is an ever-widening field of application for X-ray units. It may be used on selected aircraft or an entire fleet, as the occasion demands, and this method is a notable time-saver.

An illustration of trouble-shooting can be found in the case of an aircraft manufacturer who discovered that two vital components could have been omitted during assembly. X-ray units did the inspecting job and indicated clearly that the parts *were* installed. Because of the speed of this check, a delivery date that might have been missed was met.

Damaged aircraft are an almost ideal subject for radiographic inspection. Planes which suffer minor damages in landing, or while being taxied about an airport, may not show the full extent of structural damage incurred.

X-rays will help aircraft engineers, weldors and mechanics to make the repairs that will put the planes back into service.

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DYNAPOWER Welding Cable

for outstanding toughness and flexibility...

Better welding begins with Carol Cable. *Flexible* for easier handling . . . makes jobs go better with less fatigue. *Tougher* for longer life. Saves replacement costs . . . cuts down work interruptions.

Like all Carol Cable, Dynapower Welding Cable is *precision made*. Carol's special stranding combines thousands of soft, fine wires into a cable that's superbly flexible. And husky Carol insulation—specially compounded—assures maximum resistance to damage by abrasion, oil and solvents.

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CAROL CABLE COMPANY

DIVISION OF THE CRESCENT COMPANY, INC., PAWTUCKET, RHODE ISLAND

Serving industry for more than 30 years

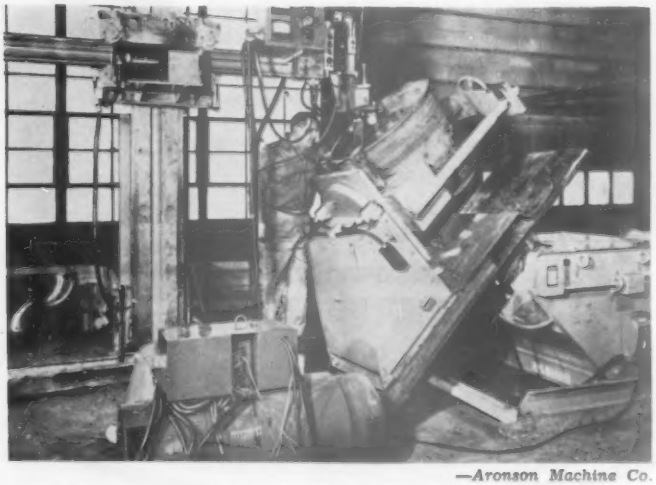
on the job...

—Jones & Laughlin Steel Corp.

NEARLY 4 miles of 14-in. seamless pipe were welded to provide heat for new U. S. Air Force base at Plattsburgh, N.Y. These pipes, with ⅜-in. wall, will carry water at 380 F into buildings. Hydrostatic test of 600 psi for 6 hours is 200 psi over normal operating pressure.

—Baldwin-Lima-Hamilton Corp.

FORGED and rough-turned steel rings are welded to end openings of 1-in.-thick shells for 25,000-kva condenser at Elliott Co., Ridgeway, Pa. Rings, which serve as bolting flanges, are 60 in. in diameter and have a 6-in. face. Shells are hydrogen-cooled, so welded flanges provide strength to withstand accidental explosion.



—Aronson Machine Co.

UNUSUAL arrangement of a headstock mounted on extra-large positioner table permits inside fillet welds on both ends of steel wheels weighing up to 1,000 lb and ranging from 22 to 40 in. in diameter. Welding positioner, with load rating of 6,000 lb, and headstock, rated at 2,500 lb, are both standard models.

—Velocity Power Tool Co.

AUTOMATICALLY-fired air-acetylene torch helps speed-up solder tacking of hot air pipe joints. Washoe Sheet Metal Co., Reno, Nev., formerly used metal screws for operation; solder tacking with this torch reduced time per joint from 5 minutes to 30 seconds. Torch has built-in lighting device; shuts off when trigger is released.

it's almost magic...

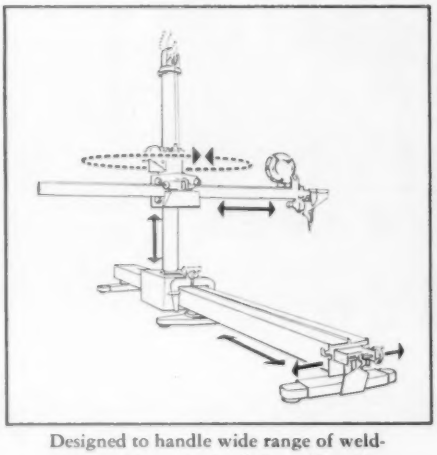
. . . when you can make difficult precision welds with robot-like regularity. But that's exactly what the LEWIS "Universal" can do.

Whether used for volume production or custom jobs, this automatic fixture cuts the time, sweat and high costs normally associated with large weldments.

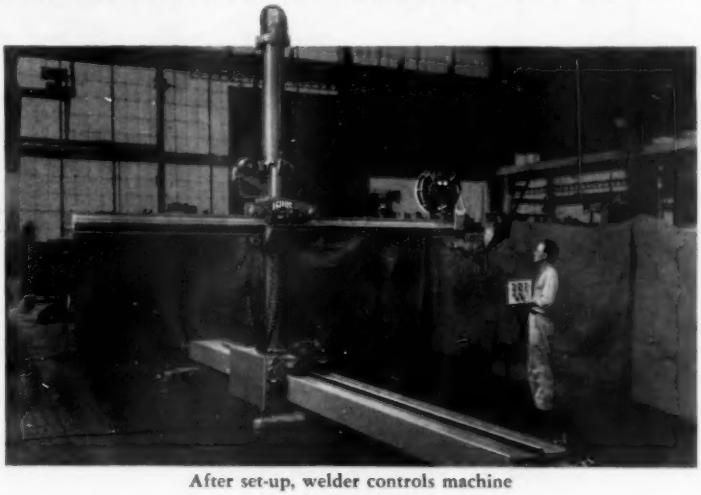
The "Universal" is portable . . . permits simultaneous 3-directional operation . . . has an adjustable base for quicker positioning of heavy weldments. In addition, any standard head can be installed for welding, flame cutting or hardening. Dual heads can be used to make parallel welds.

For complete details, write today or call BEdford 2-2500. Learn why *it's almost magic* . . .

. . . THE LEWIS "UNIVERSAL" AUTOMATIC WELDING FIXTURE



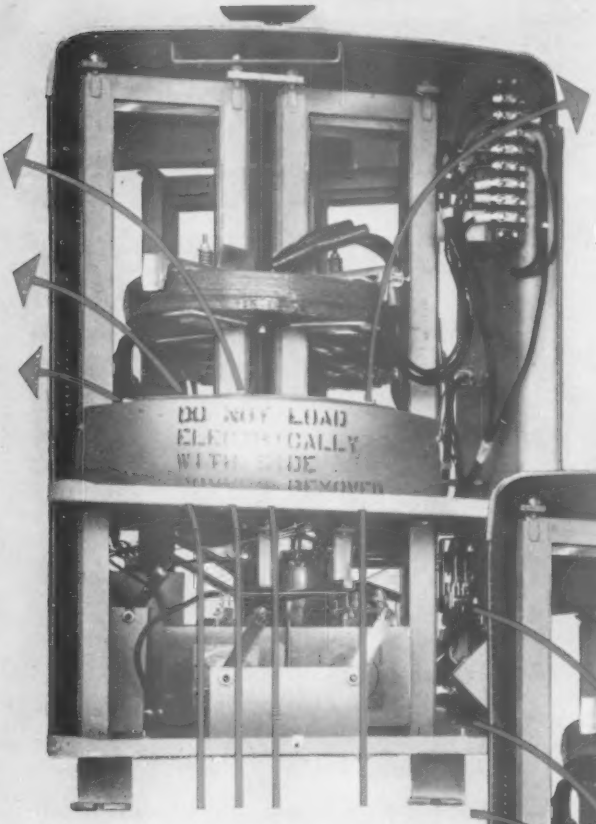
Designed to handle wide range of weldments, this unit is fully adjustable.



After set-up, welder controls machine with a remote pushbutton console.

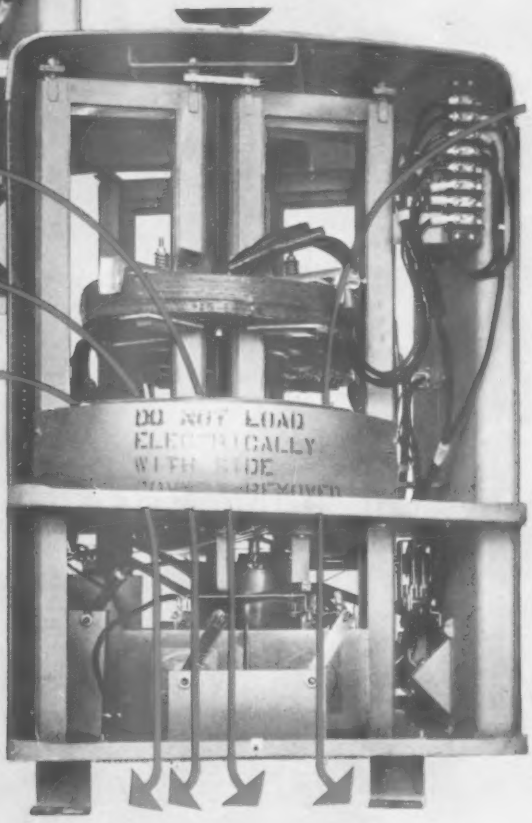
LEWIS

THE LEWIS WELDING & ENGINEERING CORP.
WELDING DIVISION
77 Interstate Street — Bedford, Ohio
8712-LW



SWITCH DOWN

With switch in normal down position fan draws cool air up through welder.



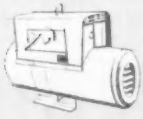
SWITCH UP

With switch up air is blown down through rectifier stacks to dislodge dust.

FOR ALL YOUR WELDING NEEDS

General Electric offers all three types of heavy-duty welders—AC Transformer, DC Rectifier, Motor-generator—plus a complete line of equipment, accessories, and electrodes.

AC Transformer



Motor-generator

Engine Drive

General Electric Exclusive

Reversible Fan Dusts Off Rectifier in Seconds; Gives General Electric Rectifier Welders as Much as 50% Longer Life

Available only with General Electric rectifier welders, the 14-in. combination cleaning-cooling fan gives you as much as 50% longer welder life!

Here's why! This double-duty fan automatically cools the welder, continually drawing cool air from floor level, up through the rectifier stacks, and over the coils. The possibility of recirculating warm air is thus eliminated.

At the flick of the convenient switch the fan reverses, blowing accumulated dust off the rectifier stacks. This cleaning action helps free the stacks of fibrous dust which frequently blankets the leading edges of rectifier plates, blocking the air flow between the plates and causing burnouts.

Other exclusive features of this new line of General Electric rectifier welders include:

(1) FULL-TIME ARC-FORCE CONTROL which helps eliminate electrode sticking. This feature, exclusive with General Electric, permits the use of shorter arcs, because short-circuiting metal droplets which ordinarily would freeze to the electrode are blasted away.

(2) SILICONE INSULATION on both transformer coils helps protect the welder from damage due to overheating, fumes, and moisture.

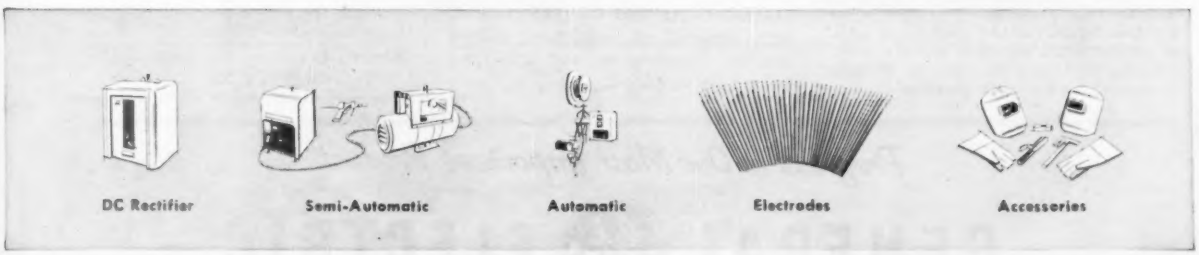
(3) EASILY REMOVABLE SIDE COVERS which come off with removal of just three screws. This simplifies routine maintenance; no need to remove primary leads or handles —no need to use cranes or hoists.

These and other G-E engineered extras (see comparison chart below) are available only with G-E rectifier welders. Contact your local General Electric Welding Distributor (he's listed in the yellow pages of your phone book) or write for bulletin GEA-6242, Section 711-5, General Electric Company, Schenectady 5, New York.

	Full-time arc-force control	Combination cleaning-cooling fan	Moving-coil design	Silicone Insulation	Aluminum-wound coils	Removable side covers	Reversing-polarity switch	Large, logarithmic current scale
General Electric	✓	✓	✓	✓	✓	✓	✓	✓
Manufacturer A					✓			
Manufacturer B							✓	
Manufacturer C			✓					✓

Progress Is Our Most Important Product

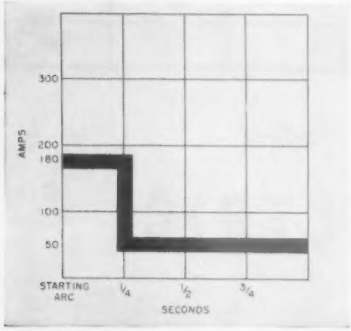
GENERAL ELECTRIC



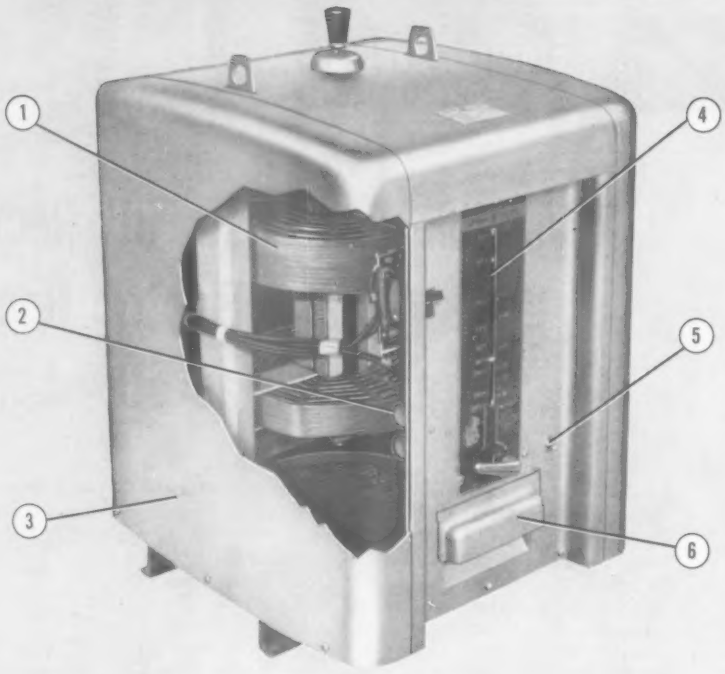
WELDING ARCS NEWS

25 TO 295 AMPS are spanned by extra-wide current range, which permits a wide number of varied applications. Low end of the range is expanded for greater accuracy.

SIDE COVERS LIFT OFF easily, with removal of just 3 screws. Maintenance is easy—no handles or primary leads to disconnect, no need to use cranes or hoists.



AUTOMATIC HOT-START gives extra surge of current when electrode touches work, reducing sticking, false starting. Welding is speeded, weld quality improved.



How G-E 295-amp AC Welders Provide Big-welder Benefits At a Small-welder Price

General Electric's 295-amp a-c welder is designed for light-duty, general purpose welding—but offers design features ordinarily found only in more expensive, heavy-duty welders. For example:

1 MOVING-COIL DESIGN provides pinpoint accuracy in current settings and resettings. Settings can be made in an infinite number of steps over a wide current range.

2 ARC STABILIZERS—two arc stabilizing capacitors provide the equivalent of 5 open-circuit volts, to make the normally steady a-c arc even steadier.*

3 REMOVABLE SIDE COVERS come off with removal of just three screws. Routine maintenance and inspection are greatly simplified.

4 WIDE CURRENT RANGE spans 25 to 295 amps. Expanded lower end of range permits extremely accurate settings.

5 AUTOMATIC HOT-START assures instant arc striking by providing an extra surge of current on electrode contact. In addition, hot-start furnishes extra penetration at start of weld, reducing "sticking".*

6 UNIVERSAL BOLT-TYPE TERMINALS located at the base eliminate the nuisance and hazards of dangling leads.

For more information, contact your nearby G-E Welding Distributor (he's listed in the yellow pages of your phone book)—or write Section 712-2, General Electric Company, Schenectady, N. Y. for bulletin GEC-1305.

*Improved arc-performance features, available optionally.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Classifying copper and copper-base alloys — Part 1

(Part II—**selecting copper and copper alloys**—will appear in the August issue of WELDING ENGINEER)

Standard Commercial Wrought Copper and Copper-base Alloys	*Nominal Composition—percent*									
	Cu	*Zn*	*Pb*	*Sn*	*Ni*	*Al*	*Si*	*Mn*	*Fe*	*P*
ELECTROLYTIC TOUGH PITCH COPPER	100 (1)									
DEOXIDIZED COPPER	100 (2)									
OXYGEN-FREE COPPER	99.92(3)									
GILDING, 95%	95	5								
COMMERCIAL BRONZE, 90%	90	10								
RED BRASS, 85%	85	15								
JEWELRY BRONZE, 87.5%	87.5	12.5								
LOW BRASS, 80%	80	20								
CARTRIDGE BRASS, 70%	70	30								
YELLOW BRASS	65	35								
MUNTZ METAL	60	40								
LEADED COMMERCIAL BRONZE	89	9.25	1.75							
LOW-LEADED BRASS (TUBE)	66	33.5	0.5							
LOW-LEADED BRASS	65	34.5	0.5							
MEDIUM-LEADED BRASS	65	34	1							
HIGH-LEADED BRASS (TUBE)	66	32.4	1.6							
HIGH-LEADED BRASS	65	33	2							
EXTRA-HIGH-LEADED BRASS	63	34.5	2.5							
FREE-CUTTING BRASS	61.5	35.5	3							
LEADED MUNTZ METAL	60	39.4	0.6							
FREE-CUTTING MUNTZ METAL	60	39	1							
FORGING BRASS	60	38	2							
ARCHITECTURAL BRONZE	57	40	3							
INHIBITED ADMIRALTY	71 (4)	28		1						
NAVAL BRASS	60	39.25		0.75						
LEADED NAVAL BRASS	60	37.5	1.75	0.75						
MANGANESE BRONZE, (A)	58.5	39.2		1				0.3	1	
ALUMINUM BRASS	76 (4)	22				2				
PHOSPHOR BRONZE, 5% (A)	95			5						.03-.35
PHOSPHOR BRONZE, 8% (C)	92			8						.03-.35
PHOSPHOR BRONZE, 10% (D)	90			10						.03-.25
PHOSPHOR BRONZE, 1.25% (E)	98.75			1.25						Trace
FREE-CUTTING PHOSPHOR BRONZE	88	4	4	4						.01-.50
CUPRO-NICKEL, 30%	70				30				.40-.70	
CUPRO-NICKEL, 10%	88.7				10				1.3	
NICKEL SILVER, 65-18	65	17			18					
NICKEL SILVER, 55-18	55	27			18					
NICKEL SILVER, 65-15	65	20			15					
NICKEL SILVER, 65-12	65	23			12					
NICKEL SILVER, 65-10	65	25			10					
HIGH-SILICON BRONZE, (A)	94.8 (3)						3			
LOW-SILICON BRONZE, (B)	96.0 (3)						1.5			

NOTES: *(1) Copper plus Oxygen, Oxygen nominally 0.04%*
(2) Copper plus Phosphorus, Residual Phosphorus nominally 0.02%
(3) Minimum
(4) Also 0.02 to 0.10 percent of an inhibitor, such as As, Sb or P

—Courtesy Copper & Brass Research Ass'n.

PAGE offers a line of —the right packaging—the

In ever-increasing numbers, users of welding wire are looking to PAGE for their wire needs. The one biggest reason is that they have found that PAGE—in a unique degree—has the *facilities, experience* and *special skills* to draw and furnish exactly the right wire for your welding jobs. And behind that lies a story.

All Processes Closely Controlled

PAGE is *the one supplier* of welding wire who is in a perfect position to control the chemical and physical properties of its products all the way from billet to rod to finished wire. That is because we purchase our raw materials to rigid specifications; we select heats of carbon, low alloy and stainless steels for certain optimum characteristics—then, upon delivery to the mill, we analyze representative samples for compliance with PAGE specifications.

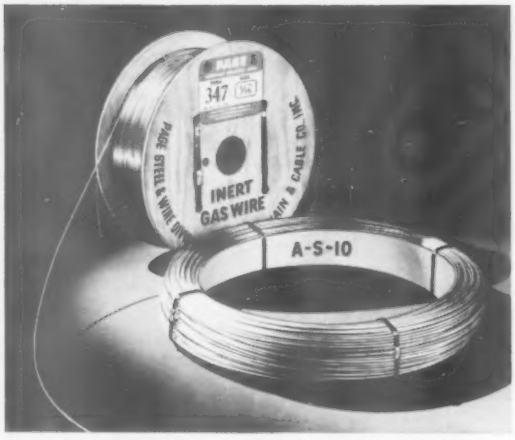
These purchasing and testing practices permit the production of wire capable of depositing weld metal which complies absolutely with welding requirements. *You don't have to compromise* when you buy, specify or use welding wire by PAGE!

Page Meets Today's Needs

One example of PAGE's facilities for furnishing a wide range of quality-controlled welding wires for modern applications is shown by our stainless steel automatic welding wire. To meet needs of recent developments in the field of inert gas welding, PAGE offers fine wires (.020″ to .09375″) for use in semi-automatic arc welding machines in which the arc is shielded with argon, helium or CO_2 inert gas. These wires, wound on non-returnable plywood reels, furnish the utmost in convenience and freedom of wire feed.

Wire for All Types of Welding

You will find many advantages in standardizing on PAGE welding wire for your needs—whether for automatic or manual use . . . arc or gas welding of all types. Not only does PAGE offer a wide range of analyses, as shown in the column at the right, but we have unsurpassed facilities for manufacturing wire to any desired size, temper or surface finish—and can furnish it promptly, in many methods of packaging, through the convenient nation-wide PAGE Distributor service.



The Right Wire— Wide Analysis Range

There are *26 different analyses* in the PAGE line. These cover the field of applications: heavy automatic submerged arc...light manual submerged . . . inert gas manual . . . automatic, tungsten or metal arc.

AUTOMATIC WELDING WIRE

CARBON STEEL...Any carbon from Armco (.025 max.) to high carbon (.90-1.10)

LOW ALLOYS...All the most popular welding grades.

STAINLESS...All standard AISI grades. Other types on request.

GAS WELDING RODS

Since 1914, the standard of quality, uniformity and satisfactory performance. PAGE offers an exceptionally wide range of rods—furnished in 36-inch lengths, in coils or on reels in the following materials: Mild Steel • Armco • Low Alloy • Carbon Steel • Stainless Steel • Manganese Bronze • Naval Bronze

BARE ELECTRODES

PAGE Bare Electrodes are supplied in any carbon from Armco to high (.90-1.10) carbon.

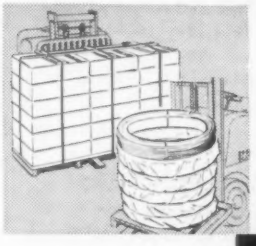
METAL SPRAY WIRE

Furnished as follows: Any carbon from Armco to 1.00 carbon • Low Alloy • Stainless Steel • Manganese Bronze • Naval Bronze

the right welding wires
right service—for modern needs

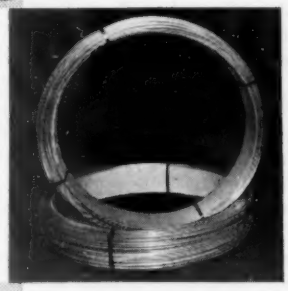
PAGE WIRES ARE PACKAGED RIGHT

PAGE Welding Wires are packaged in a wide variety of ways for the most complete protection and the utmost convenience in handling, in stocking and in use.



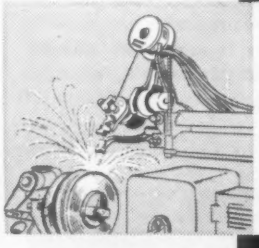
Wrapped Coils and Coils in Cartons

Single and palletized coils, each coil steel-strapped and wrapped in waterproofed paper. ...Also, coils in individual cartons, singly or palletized.



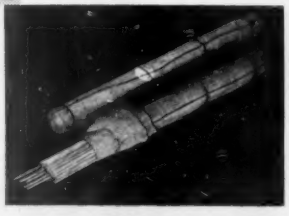
Welding Wire in Coils

PAGE A-S Automatic Welding Wire is regularly furnished in layer wound coils with cardboard liner, four Signode straps to facilitate coiling and easy unwinding.



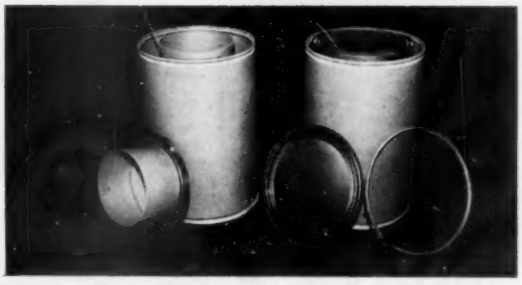
Handy Reels

PAGE Inert Gas Welding Wire is available on reels: Precision thread-wound on twenty-five-pound, non-returnable reels to fit all popular inert gas welding machines.



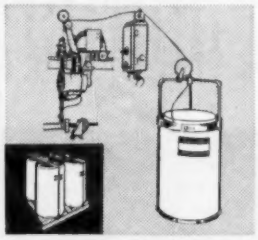
Gas Rod Packing

Gas welding rods are packed in 36" lengths in 50-lb. bundles—paper and burlap wrapped. Also in coils and reels (approx. 150 lbs.)—burlap wrapped. Stainless rods also come in 10-lb. fibreboard cartons.



LEFT: Pay-off-pak ready for filling, with "wire slinger" for uncoiling at extreme left. RIGHT: "Wire slinger" installed for feeding out wire; also, below, re-usable lid and retaining ring. Ring insures smooth feed-out of wire without snarls or kinks.

Sketch at right shows Pay-off-pak for continuous feeding up to 500 lbs. of wire without rethreading. Also (inset) lightweight Leverpaks. Both these containers protect against coil distortion... are easily opened, resealed, handled, stored.



PAGE Service Means Prompt Delivery From Local Stocks

You can get PAGE automatic arc welding wire, or oxy-acetylene welding rods quickly and easily from your nearby PAGE Distributor.

PAGE Distributors carry ample stocks from which your requirements can be filled without delay or inconvenience to you. This handy service not only saves you time in getting what you need, but makes it unnecessary for you to make a sizeable investment in inventory.

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Folder **DH-402A**—PAGE Submerged Arc and Inert Gas Welding Wire.

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There is a Dockson Better-Built Torch for all your jobs. Dockson Torches incorporate a new, longer life, better seal compound developed especially for oxy-acetylene service in both the mixer and union rings. Dockson's two-ring construction means fewer rings to replace, stronger construction, prevention of possible breakthrough.

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These weldors prove that . . .

A job shop gives

BROOKE Welding Service operates two of these mobile units that are well-equipped to handle any welding job. *(Courtesy American Brake Shoe Co.)*

IN AN AGE of specializations, versatility on the job can be a refreshing and rewarding experience. And, if ever there was a job that demands a many-sided knowledge of welding in all its forms, it's the job performed daily by George Brooke, owner of Brooke Welding Service, Chicago Heights, Ill.

Together with helpers John Frakes, Elmer Marcott and Dick Silcox, Mr. Brooke takes on a variety of work that may range from repairs on a child's tricycle, to spectacles, to the "specialty of the house"—industrial repair work with the emphasis on hardfacing.

Years of Experience

A weldor right from the start, Brooke has worked for a manufacturer of hardfacing alloys, a mine equipment manufacturer and a manufacturer of steel burial vaults.

When the latter firm took on the job of fabricating supporting stands for enamel filling station signs, Brooke assumed the work as part of his duties. Then, when the company dropped this profitable account, he picked it up as a part-time occupation.

Successful Operation

"Part time," in this case, meant 10 or 12 hours *after* completing a full 8-hour day at his regular job. So, with the encouragement of a profit that amounted to more than twice his daytime wage, Mr. Brooke made his decision and stepped into the role of entrepreneur.

This was in 1927, and one small

Smiling from left to right are Dick Silcox, Elmer Marcott, owner George Brooke and John Frakes.

Community Service

garage, plus some welding equipment and tools, constituted the sole assets of Brooke Welding Service. Today, in addition to his three welding assistants, Brooke operates two well-equipped mobile units and, three years ago, constructed an addition to allow business expansion.

Successful firms, say those who know, are not *just* like every other firm in their field. They have something extra—a "gimmick" that's a real profit-builder.

In the case of Brooke Welding Service, this specialty is hardfacing. Mr. Brooke's initial background in working with this valuable repair tool gave him a head start over other job shops in the area that he has never relinquished.

Hardfacing Equipment

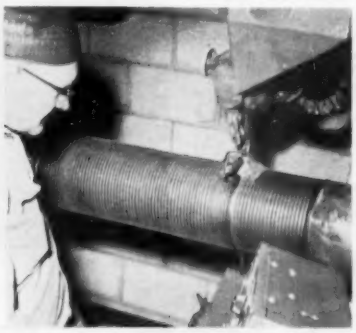
For many large hardfacing jobs, the firm uses a semiautomatic welding unit in conjunction with a lathe that has been geared down to rotate cylindrical and conical work under the welding head. Tractor rollers and idlers, heavy-duty mixer shafts and blades, and many other shafts and bearing surfaces have all received additional service life in the Brooke shop.

SOME customers drive right in for repairs. This truck mixer has just had its mixer paddles hardfaced.

Though most work can be done in the enlarged shop area, the constant demand by plants and shops in the area for all kinds of on-the-spot welding jobs prompted the purchase of two flat-bed trucks. Outfitted with a complete line of welding equipment, these trucks handle a wide variety of repair jobs.

With this skillful mixture of service jobs and profitable repair accounts, Brooke Welding Service will undoubtedly continue to insure its own growth, and to fill a valuable spot in the commercial life of its community.

NO job is too small for the men in this job shop. Here, owner George Brooke reassembles tricycle after making brazed repairs.



LARGE mixer shaft is hardfaced under supervision of Dick Silcox. This job required four different types of special alloys.

"I recommend the Airco 387 Electrode for welding mild steel"

It's the most versatile of all 6012 electrodes. Good wetting action of the Airco 387 electrode permits the use of high current and travel speed on both thick and thin sections. The fluxing action of the slag results in smooth, uniform deposits of superior appearance with minimum spatter. Especially recommended for single pass horizontal fillet welds because of ease of handling, good weld profile and ability to withstand high welding current.

This is but one of many electrodes in Airco's complete line that also includes stainless steel, hard-facing, cast iron, general and special purpose electrodes. Send for free Airco Electrode Guide which will help you select the right electrode for your specific job. Request catalog 1318-WE.

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The Speed of Iron Powder Plus the Quality of Low Hydrogen is combined in the

New Iron-Powder Low-Hydrogen Electrodes

for high-speed all-position welding

Now, with P&H Iron Powder-Low Hydrogen Electrodes, you get a cost-cutting rod that permits high-speed, all-position welding, even on "problem" steels. You not only get the improved bead appearance and low spatter of iron-powder electrodes, but also the superior physical properties and quality of low-hydrogen rods.

P&H Iron Powder-Low Hydrogen Rods are recommended for welding of heavy sections exposed to severe shock and abuse. They give you welds of X-Ray quality with good impact properties at low temperatures. Moreover, you get smooth fillets without special effort.

Choose from a complete selection of P&H Iron Powder-Low Hydrogen Electrodes with tensile strengths from 70,000 to 85,000 psi.

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An increasing cost differential between aluminum and copper led Allis-Chalmers to try an experimental production set-up. They were pleased to find that . . .

Aluminum-wound step regulators can be Tig welded

By C. W. Nielsen
Transformer Dept.
Allis-Chalmers Mfg. Co.
Milwaukee, Wis.

ALUMINUM-to-aluminum connection on this regulator is made by weldor using Tig unit. Use of helium as shielding gas prevents oxidation.

CHANGING over step-type regulators from copper to aluminum involves many design and production problems. Aluminum-wound units recently completed and tested provide answers to questions which probably will be asked if aluminum is adopted for regular production of regulators.

To make a conversion to aluminum coils in step regulators, the following conditions should hold true:

1. Aluminum-wound units, electrically and mechanically, must be equal to, or better than, equivalent copper-wound units.
2. Over-all size of aluminum-wound units should approximate copper-wound units to permit use of the former as replacements.
3. Cost of manufacturing aluminum-wound units must be equal to, or less than, that of copper-wound units.
4. Aluminum must be available in quantities sufficient to assure continuous production for the foreseeable future.

Simplifying a Changeover

There are common construction methods which tend to simplify the changeover. All connections that are normally brazed in the standard copper-wound units are either brazed or welded in aluminum units. Since both types are oil filled, connections between aluminum and copper are made under oil, thereby eliminating galvanic corrosion problems.

Tap leads on the series winding are bolted to the mechanism contact studs in both types. Aluminum and copper are joined between the coil and the mechanism studs to permit the use of copper-to-copper bolted joints. This arrangement allows the use of copper bushing leads for connection to the brass or copper terminals.

Tig-Welded Connections

High-frequency Tig (tungsten inert-gas) welding, with helium as a shield, provides an excellent electrical and mechanical connection between aluminum parts. Helium prevents oxide from forming while the metal is melted and joined. Argon may also be used for this purpose.

Brazing or welding aluminum to copper, however, is more difficult. Special techniques are required in application of heat to both metals. The flux used is quite corrosive and necessitates scrubbing the connection with a stiff brush and flooding it with water to avoid oil contamination in the finished unit.

Welded joints between aluminum and copper tend to be brittle. Alloys formed when the metals are in a molten state include those having more than 10% dilution in each other and are, in all probability, brittle. A 35-65 alloy, for example, is as brittle as glass.

Since it is impossible at present to avoid such alloy combinations, other methods were investigated. A cold-pressure-type butt connection was made on a machine which cuts parallel faces on the surfaces to be joined and forces them together hydraulically. This created a ductile molecular bond stronger than the aluminum.

Experiments With Aluminum

Several feeder voltage regulators were built using standard construction (including cores, end frames, tanks, bushings and insulation), but having special coils in which aluminum magnet wire was substituted for the copper. Standard load tap changers, with copper and tungsten-tipped contacts and other copper or copper alloy current-carrying parts, were used in these units.

Winding the main coil with aluminum presented no problems until the aluminum taps were added. Normal procedure with a copper winding is to maintain tension while making the brazed tap connection. When this procedure was followed with aluminum wire, however, the aluminum connections separated. Thereafter, tension was released before the wires were Tig welded.

The winding procedure worked well with single-strand conductors and tap leads. However, connections required greater care in higher current ratings where the coil conductors consisted of 18 strands of aluminum, and the tap leads of 10 strands.

Strands Welded Individually

With the Tig process, a union of aluminum occurs only where the actual weld is made. Since there is no flow as in a copper-brazed joint, tap lead strands were welded individually to conductor strands. This method necessitated separating the tap lead strands slightly to permit individual welding.

Some difficulty was encountered in winding auxiliary coils. These potential and current transformer windings are made with small-size, round magnet wire with normal tension. Since tensile strength of aluminum wire is much lower than that of copper, even with normal care the wires stretched and broke.

Reducing winding tension eliminated this problem, and auxiliary coils which had no taps were successfully wound. However, one auxiliary coil required taps and, since the small connections were difficult to make with the Tig welder, aluminum was not used in this winding.

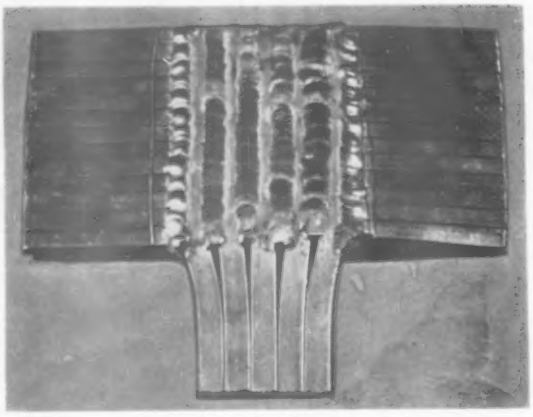
Solving Connection Problems

On higher-current units, preformed copper-to-aluminum connections were used. Some of these were flash welded, others were pressure connected. Flash welds were made on a special machine which brings the two metals together rapidly while drawing an arc.

Although the interface in the joint is thin, there is still some brittleness present. The aluminum end of this connection was Tig welded to the aluminum tap lead, and copper brazing was used for connections to the tap changer.

After disappointing experience with brazed or welded aluminum-to-copper joints, it was decided to use flash-welded or pressure-welded connections in subsequent units.

Research studies showed the comparable properties of these two connections. Both joints have higher tensile strength than aluminum. In bending fatigue tests, pressure connections failed in the aluminum (*the joint did not fail*), while flash-welded connections failed *at the interface* in every instance.



TAP lead strands are separated slightly to allow individual welding and give better electrical connection.

Aluminum Windings are Practical

Resistivity of the pressure connection varied from 91 to 102% of the parent metals, while that of the flash weld ranged from 107 to 142%. Tig welding or copper brazing within 1½ in. of the joint did not change conductivity of the pressure connection, but affected its strength adversely. Such welds and brazes must be made at least 4 in. from the joint on a flash-welded connection.

Results of developmental work, investigations and tests on aluminum show that they are electrically and mechanically practical. Aluminum-wound, step-type, oil-filled regulators can be made equal to copper-wound units in quality. However, pressure-welded copper-to-aluminum connections are preferred, and these connections should be located under oil. Load tap changers will be made with copper and copper alloy conducting parts.

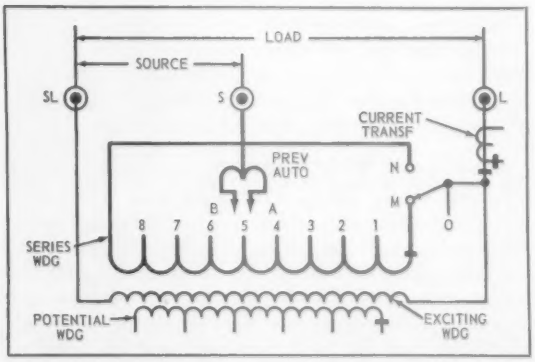
The necessary increase in dimensions may be a handicap, particularly where installation is made in cubicles of limited dimensions. In pole and substation installations, aluminum-wound units should offer no problem since space is generally available and weights will be essentially the same.

Some Cost Factors

Although the cost of equivalent aluminum magnet wire is generally lower than copper, such factors as Tig welding, copper-to-aluminum connections, and additional core steel and oil increase the over-all unit cost of aluminum-wound regulators as compared to copper-wound units.

As a result, aluminum-wound regulators are not economical at present. But, if the cost differential between aluminum and copper continues its present trend, aluminum-wound units may not be too far in the offing.

There are vast quantities of aluminum ore available in the world, and the aluminum industry will no doubt be capable of supplying a continuing demand when conversion to aluminum-wound regulators becomes economically practical.



M & T CONTROLLED-ARC POWER SUPPLY

for semi- and full-automatic welding

Here's another new Metal & Thermit product — the M & T constant voltage rectifier-type DC Welder as developed originally by the Glenn Co. When used in conjunction with a constant speed wire feed for semi- and full-automatic welding, it . . .

SIMPLIFIES OPERATION — for all practical purposes it maintains a constant arc length during entire welding cycle, thereby assuring a uniform deposit.

IMPROVES WELDING — uniform deposits are of high quality, regardless of conditions which normally affect arc length such as poor fit-up, tack welds, etc. — avoids undercutting on horizontal welds.

SPEEDS PRODUCTION — instantaneous starting and recovery get job underway faster with higher average rate of deposit — practically eliminates rejects.

CUTS POWER AND INSTALLATION COSTS — high efficiency and power factor permit lower wiring and operating power costs.

M & T Controlled-Arc Power Supply units are saving time and cutting costs on many semi- and full-automatic welding operations. Write for details on how they can help you.

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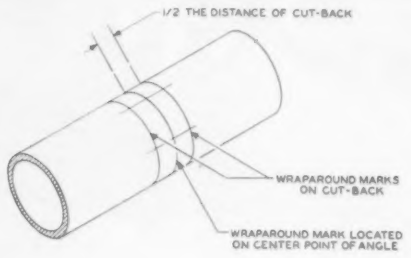
Standard Methods	Southern California Gas Company Distribution Training Department Job Breakdown Sheet	Index: 1575.0-C
Operation: Layout of an Angle or Miter in Pipe. Section 2 - Mark Angle of Cut		
Equipment Used:	Wrap around, rule, kraft paper, and soap stone.	



IMPORTANT STEPS	KEY POINTS
1. Draw wrap around mark for center point of angle.	1. Make sure wrap around fits snugly around pipe.
2. Mark 1/2 of distance of cut back on both sides of center point of angle.	2. Cut back distance for Section #1.
3. Use wrap around and around pipe at be	
4. Quarter pir	

This page was taken from a weldor's training manual published by a company that operates a thorough training and testing program. By choosing the most applicable procedures from programs such as this, you will see why . . .

Even small firms can train and test weldors

By a Staff Member

WELDOR training and testing programs have been put into effect by most large manufacturers employing a number of weldors and welding trainees.

Programs of this nature—at least, those that cover every phase of a weldor's activities—can be costly to inaugurate and operate. Without a doubt, however, they more than repay their cost by virtually guaranteeing a quality product.

So much for large manufacturers who are able to afford or absorb the expense of setting up such programs. But what about small or medium-sized manufacturers—those employing from 5 to 25 weldors—to whom the expense of hiring a qualified welding consultant to set up a training and testing program would be prohibitive?

These smaller firms cannot *buy* a program, and they hesitate to make one of their own. Yet, they clearly recognize the need for such a program.

Valuable Outline

The training and testing program for acetylene and electric arc weldors and trainees set up by Southern California Gas Co. may prove to be a valuable outline for these smaller firms —particularly those that perform extensive pipe welding operations.

Selection of candidates for training at Southern is based both on seniority and on the candidate's ability to pass a qualification test. The emphasis, however, is always placed on test results; those who pass the test are admitted for training before those who do not—regardless of seniority.

If the candidate can satisfactorily set up a welding outfit, make some simple oxyacetylene cuts, and lay weld beads on the surface of a pipe, he becomes a crewman or helper. His ultimate goal then becomes the position of fitter-weldor, and the entire training program points to this end.

Progress tests, both written and applied, are given to candidates during the training period. Failure in either test segment at any time means immediate discontinuance of training for the candidate. Written tests ask the trainee to display his knowledge of recommended safe practices and the proper methods for handling welding material and equipment.

Sample welds are made during the applied progress tests, and these are graded on appearance, strength, ductility and soundness.

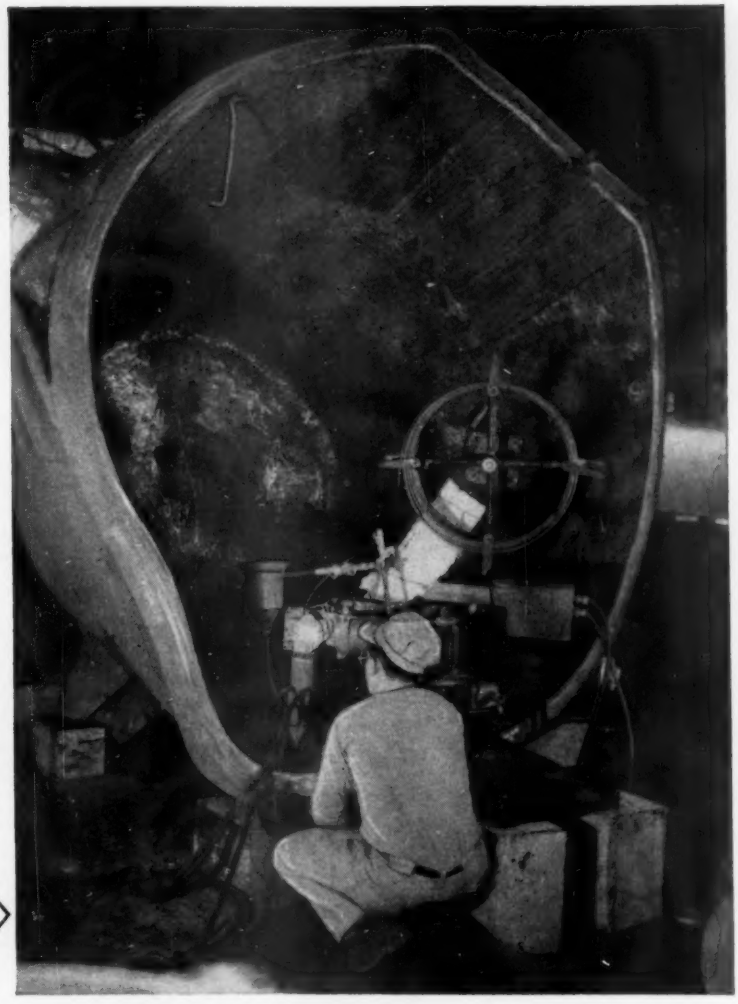
Oxyacetylene Training

For those trainees whose later work will be confined to oxyacetylene welding, Southern California Gas Co. has set the following requirements:

1. Butt welds in a fixed overhead position.

(a) The weld must be uniformly reinforced with no undercut or overlap at the edges.

Erosion From Molten Copper Reduced 300%



23-Ton Ladle Protected With HASCROME rod by Submerged-Arc Method

The hard-facing operation shown above will increase the service life of this cast steel ladle by as much as 300 per cent. The material being applied is HASCROME rod . . . a high chromium alloy that effectively resists the destructive chemical action of molten copper. The alloy is deposited on the bottom and spouts of the ladle . . . the areas most vulnerable to erosion during pouring operations.

Despite the size of the ladle . . . 6 ft. high and about 8 ft. in diameter . . . the facing operation was accomplished rapidly. Coiled rod, applied by mechanized submerged-arc equipment, was used to cover the bottom and the spouts of the ladle. Facing speed averaged 7 inches per minute. Manual metallic-arc equipment and 14-in. long coated rods were used to face the contours around the spouts.

HASCROME rod, used so successfully here, is an iron-base material that also excels in applications requiring a tough, abrasion-resistant alloy. It has outstanding resistance to impact and sudden shocks.

There are 19 HAYNES hard-facing alloys . . . a wide selection that guarantees you the right rod at the right price for your wear problem. They all can be deposited with standard welding equipment. For descriptive literature on the complete line of HAYNES rods, contact your nearest Haynes Stellite Company office.

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FIELD inspectors should periodically test the work of all company weldors and of those weldors working under contract. At the time of testing, inspectors may also instruct weldors in new procedures which will increase their ability and productivity.

(b) The weld must be stronger than pipe metal. This is determined by testing sample weld coupons in a tensile test machine.

2. Lap fillet welds in a fixed overhead position.

(a) The weld must be uniformly reinforced with no undercut or overlap at the edges. Trainees must make, whenever possible, fillet welds with a cross-section that is approximately a right isosceles triangle with legs equal to the thinner member joined. This weld is tested to destruction by bending back sections of the pipe containing the weld until weld or pipe fractures.

(b) The weld must show complete fusion to the pipe for a width at least equal to thickness of the pipe.

3. Service "T" fillet welds in fixed overhead and fixed horizontal positions. (These welds are made in a confined space on a live gas line. Weld is tested to destruction by hammering it from the main. Requirements are the same as for lap fillet welds.)

4. Lap and "T" joints in copper are tested by flattening the joint and examining for complete bonding of brazing material (hard solder) with copper.

In addition to these qualification procedures, trainees are instructed in pipe-fitting layout problems and they are taught to repair leaks in gas lines under pressure.

In this latter operation, the trainee burns through a line carrying 15 psi pressure, then caps the leak with weld metal. He is thus quickly acquainted with the problems of fire in the bellhole.

Electric Arc Training

The following test requirements must be met by those trainees who will later perform only manual arc welds on pipe:

1. An overhead butt weld in 6-in. pipe. The weld must be uniformly reinforced with no undercut or overlap at the edges. The weld is given tensile, root bend and nick-break tests. Tensile test coupons must not break in the weld; root bend samples must not fracture when tested in the guided bend machine; weld area must show clean, sound metal in the nick-break test.

2. Electric arc fillet welds are tested by breaking them through the weld and examining for complete fusion. Further requirements for arc welding are the same as for oxyacetylene welding, and arc welding trainees also receive layout training.

Follow-up Testing

Periodically (at least once a year) every active weldor is given a test covering all welding operations normally encountered in the field.

Two days are allowed for the test: on the first day, the actual test is given; the second day is devoted to improving those operations in which the weldor lacked proficiency. Any new procedure of value to them may also be taught to the weldors at this time.

The Distribution Dept., which tests all company weldors, also conducts tests for those weldors working under contract on a specific job. Pipe joints similar to those used on the job are the criteria for these tests, and requirements are similar to those outlined for company weldors.

Work performed by contractors' weldors is also tested at the job site. Inspectors carry portable tensile and bend testing machines with them for this purpose. Rejected welds mean weldor disqualification.

Standards Mean Quality

Whether a weldor training and testing program similar to that used by Southern California Gas Co. is put into effect or not, there still remains a need for some *thorough* and *consistent* means to achieve and control weld quality.

The burdens which such a program initially place on both weldors and management should, under proper administration, be converted into a prime asset which will express itself in terms of a heightened individual pride in sound workmanship on the part of the weldor.

And, on the part of management, there should exist a satisfaction in marked cost reductions and increased assurance of a quality product.

Measuring rebuilt idler at Excavators Welding Co., Westbury, Long Island

REBUILD WORN PARTS TO EXACT SIZE

with Amsco® Automatic Welding

Rebuilt Track Rollers and Idlers give twice the life of original parts

Every day more contractors and service shops are finding the cost-saving answer to tractor parts replacement. It's the Amsco "550" Automatic Welder . . . plus Amsco AW-79 alloy steel electrodes.

The rugged Amsco "550" Welder is specially designed for this heavy-duty service. It rebuilds and hardsurfaces to exact size . . . at *half the cost* of replacement parts. And service life is normally *twice* that of the original part!

Ask your Amsco Distributor for full details on the "550" Automatic Welder and the full-line of Amsco Hardfacing Electrodes.

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American Manganese Steel Division • Chicago Heights, Ill.

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No. 1 WELDING FLUX

Acts as a cleansing agent—removes all impurities in the metal at the weld—prevents formation of oxide—eliminates blow holes—makes possible a better granular, softer, more ductile structure in the weld. Starts melting at 1150°—completes: 1275°.

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11—Tinning Compound
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Choose the one best suited to your needs and order by number. All ANTI-BORAX Products guaranteed. Send for circular and free sample.

ANTI-BORAX COMPOUND CO., INC.
FORT WAYNE, INDIANA

Welding gives Texas another "tall tale"

STEEL framework for 26-story addition to 4-story base is almost completed.

—Courtesy Hill Equip. & Supply Co.

THE BIGGEST thing in Fort Worth, Texas, these days isn't hard to find. It's the new Continental National Bank building, which is not only the tallest structure in the city, but is also said to be the tallest all-welded building in the world.

Providing approximately 261,000 sq ft of floor area, the blue and white aluminum-clad skyscraper is 30 stories tall. It was completed on June 1.

Steel for structural fabrication was supplied by Mosher Steel Co. of Dallas, which estimates total weight of the job at about 1,379 tons. All column joints were positioned in the shop to allow the use of large-size E6010 and E6020 electrodes.

Erection of steel on the job site was done by John F. Beasley Co. of Dallas using E6010 electrodes, and this welded fabrication has reportedly achieved cost reductions considerably below any previously obtained.

Notable Savings

One reliable source, contrasting welding to riveting and bolting, estimated a consistent 18 to 25% savings in material and shop labor costs, and a reduction in erection costs that was almost as great. In addition to its economy, the welding method of construction gave the surrounding area large quantities of peace and quiet.

Originally begun before the Korean war, the building was planned for 28 floors. The steel shortage incurred by the war halted construction at four stories, and the present 26-story addition was not started until August, 1955.

A team of weld inspectors has used X-ray equipment in the shop and on the job site to test weld soundness.

WELDS 2 PIECES OF ⅛ INCH STEEL!
Welds 18 gauge steel 100 spots a minute . . . lighter gauges even faster!

Featuring the new
TRANSOIDAL
(A development of the toroidal coil)
TRANSFORMER
(Fully protected by Patent Applications)

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TRADE MARK

SP-100 SPOT WELDER
Obsoletes All Other Welders of Comparable Rating!

- TRANSOIDAL welding transformer with radially wound primary
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- Repeat, non-heat features
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- Controls mounted on one side panel for convenience
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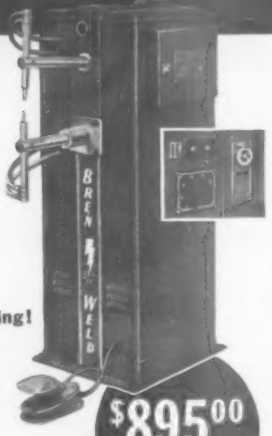
- Welding arms, 12" standard; up to 36" supplied at slight extra cost
- Adjustable lower arm furnished at extra cost
- Draws 50 Amps. at 220 volts, single phase

24 HOURS DELIVERY FROM STOCK!

Write for 4-page color brochure containing complete specifications



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Integrity Since 1919
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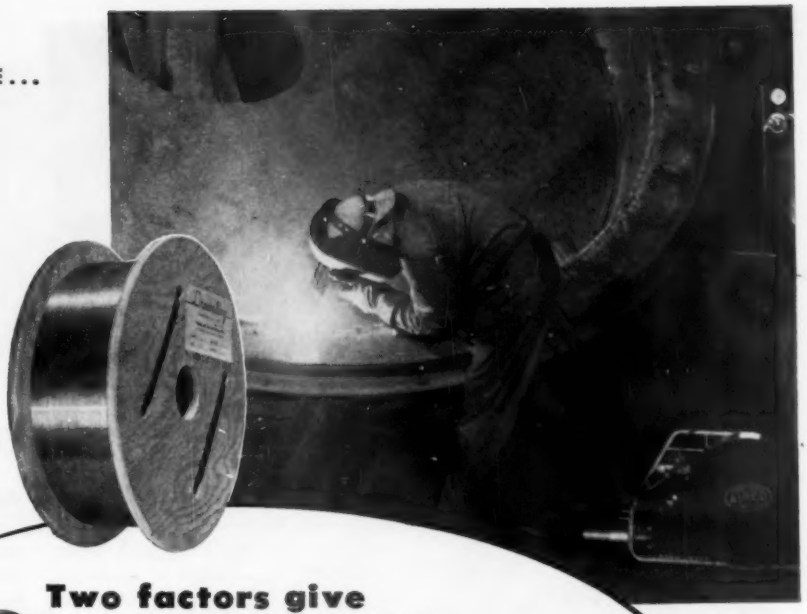
STAINLESS STEEL WELDING WIRE...

Spooled... layer wound to assure a smooth, even feed. Sizes: .035", .045", 1/16", 5/64" and 3/32" diameters.

Coiled... layer wound on rims for submerged arc welding. Sizes: 1/16", 5/64", 3/32", 1/8", 5/32", 3/16" and 1/4" diameters.

Cut Lengths... straightened and cut wire furnished in 36" lengths for inert arc and gas welding.

Sizes: .035", .045", 1/16", 5/64", 3/32", 1/8", 5/32", 3/16" and 1/4" diameters.



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WELDING WIRE

best on-the-job performance

Drawalloy welding wire is a product of two factors—years of experience in the welding industry combined with the best wire mill drawing practices. The result is clean welding wire with the proper finish, temper, diameter tolerance and chemical analysis. It's a wire that produces the highest quality welds continuously—with an easy, sure feed and a constant, smooth arc.

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Coiled... precision drawn for perfect roundness to insure continuous, smooth feed with any automatic head. Available in six Types for hard-facing applications.

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Avoid Scrap Losses, Reworks—Rejects

Your DRY-ROD Oven insures against defective welds caused by moisture. Protects low-hydrogen, austenitic, special alloy electrodes, as well as iron powder contact rods. Aids steadier welding, with less slowdown, reworks, and scrap. Repays its cost out of rod salvage alone. Costs less than 15c in 24 hours.

DRY-ROD is completely wired, ready to use. Available in 2 sizes for all industrial requirements. See your welding supply dealer.

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DIVISION OF

PHOENIX PRODUCTS CO.

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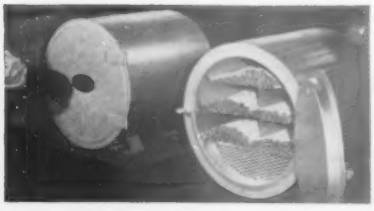
X-dr-22



HERB Quartz today—marking his 52nd year in welding.

The oldest living oxyacetylene weldor in the U. S. will reminisce in this and future issues about days when welding was known simply as "metal joining."

50 years a weldor

IN THE YEAR 1903, a ship entered Boston Harbor, ending a voyage from Brest, France. A French chemist named Beltzer was a passenger on the ship, and in the hold were components of the first oxyacetylene plant to be built in the U. S.

Sometime during the following year (1904), Beltzer brought his oxyacetylene welding plant and equipment to Best Mfg. Co. Herbert Quartz, then 22 years old, was given a helper's assignment that brought him into close contact with this new metal-joining process, and had a profound effect upon his life.

Oxygen Maker

Herb's new task was to manufacture oxygen—an unromantic occupation for a young man eager to rise in the new field of welding. His distress was heightened by the sight of M. Beltzer in a stovepipe hat, long-tailed coat and white gloves on the job.

Herb's future in welding was assured, however, by his brother, who persuaded him to stick to his job.

Equipment used to manufacture oxygen in that Pittsburgh plant more than 50 years ago consisted of a generator, two filter barrels, a scrubber, gasometer, and a single-stage compressor. Bluestone (blue vitriol) and bleaching powder were the raw ingredients used in the process.

The generator, 24 in. in diameter and 3 ft high, was filled with water up to a glass indicator about a foot from the top. A 2-in. pipe carrying steam was inserted into the water in the generator to bring it to boiling temperature. At the same time, a copper kettle containing water and bluestone was placed on a gas plate and brought to a boil.

A funnel of bleaching powder was then placed in an opening atop the generator and the cover and gasket for the opening were bolted down. A copper tank with pet-cock above the generator was filled with a bluestone solution.

When the pet-cock was opened, the bluestone solution entered the generator through a copper tube. Oxygen resulting from this simple process passed through the top of the generator, into filter barrels, through the scrubber and on to the gasometer.

Oxygen tanks were filled to a capacity of about 50 cu ft by a small, glycerine-lubricated compressor. Proper amounts of chlorine in the oxygen were checked by silver nitrate before oxygen reached the scrubber.

German Generator

The German-made acetylene generator was a high-pressure, water-to-carbide feed type. Common practice in 1904 called for 35 psi of acetylene on the single-ply hose then in use. A mere two-ply hose contained the oxygen, so a watchful eye had always to be kept on hoses.

In 1906, two years after Herb began his assistantship under Beltzer, the oxyacetylene process was given the official title of autogenous welding. That same year, Best Mfg. Co. opened the first welding shop in the country—the Pittsburgh Welding Co., on 38th St. near Penn Ave.

This fortunate move gave Herb his first big break. He was given the job of installing the welding plant and all necessary piping for the oxygen and acetylene lines.

you know, this miller AEA-200-L is quite a deal

The man's right of course, and here's why: As a welder, it provides a full 200 amperes of ac welding current . . . handles ac or ac-dc electrodes up to 3/16". As a power plant, the rotating field design generator — coupled to Onan CK engine — supplies 4500 watts of 110/220 current; or, 1000 watts of dc power while welding. Waterproof and light weight (435 lbs.), the AEA-200-L offers easy portability, all-weather operation and real versatility. Rubber-tired running gear and road trailer available. Model AEA-200, without auxiliary power, weighs 420 lbs. Larger engine driven units to 350 amperes with generator output of 10KW.

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APPLETON, WISCONSIN

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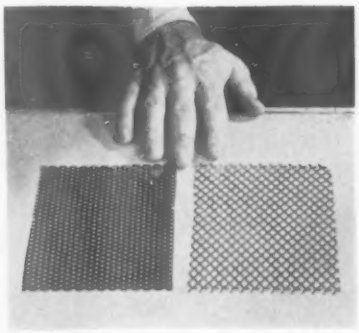

EXPANDED silver brazing alloy strips offer sizable weight reduction over solid strip. Meshes here have differing thickness and composition.

Brazing alloy in mesh form

WEIGHT reduction is the prime advantage cited for a silver brazing alloy being produced in a new form—expanded and rolled strip. The expanded strip may weigh only 1/3 as much as a solid strip of identical cross-section thickness.

Aviation assemblies normally assembled by brazing should profit most from the new meshed alloy, according to the manufacturer, Handy & Harman, New York City. Precision thicknesses down to 0.003 in., and strip widths up to 12 in., are being produced.

Basis for the new material is conventional solid strip, which is first expanded, then rolled to specified uniform thickness. Degree of expansion and final thickness after rolling determines weight of the strip.

Interstices in the meshed strip will not be dry spots when the alloy is heated. High fluidity of molten silver brazing alloys insures thorough wetting of the joint. Capacity for flowing to all joint areas reportedly will not be affected by discontinuous surfaces.

Solid strip would have to be reduced to less than 0.001 in. in thickness to achieve a weight similar to the thinnest (0.003-in.-thick) expanded strip. This would make it virtually useless, however, because thin foils are difficult to handle.

As in the case of solid strip, the new mesh strip must also contain a volume of filler metal sufficient to cover joint areas to required thickness.

AUTOMATIC TORCHES

THE HEART OF ECONOMY

Approved by Underwriters' Laboratories

BY ACTUAL COMPARISON

USING NON-AUTOMATIC TORCH . . . . . 12 Pieces Welded
USING NON-AUTOMATIC WITH GAS SAVER . . 18 Pieces Welded
USING HARRIS AUTOMATIC TORCH . . . . 28 Pieces Welded

Using the same amount of Oxygen and Acetylene for each set-up, this "Actual Comparison" Demonstration proved the Harris Automatic Torch to be a profitable investment for economical and efficient welding work.

Let our local Distributor show you the "Actual Comparison" test in your plant and explain quickly and simply why the Harris Automatic has the greater piece production at the lowest cost.

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Harris is the originator of the "Automatic" Torch and with almost 50 years of building "Know-How" behind every torch, the buyers and users get tremendous returns on their torch investment.

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SERVING THE METAL INDUSTRY SINCE 1905

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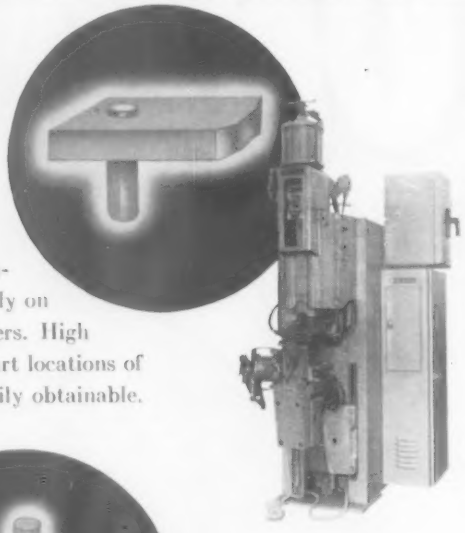
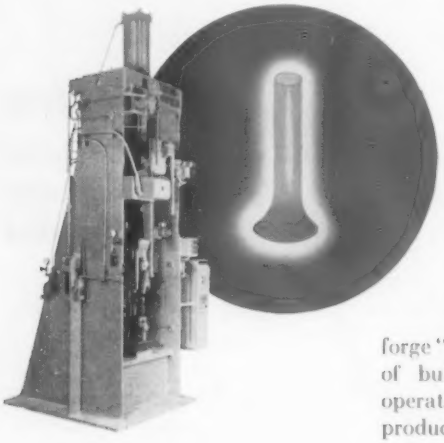


Resistance Hot Upsetting

Upsetting or riveting operations are performed quickly on standard resistance welders. High production and precise part locations of dissimilar metals are readily obtainable.

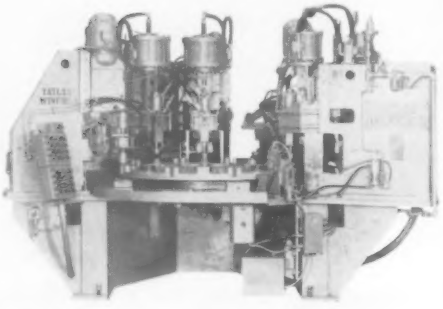


Metal Gathering

Operations on ends of rods, also by resistance heating, are done in machines with forge "flow control." Shape and size of bulb ends permit machining operations on bulb for most efficient product manufacture.

High Production

Special machines can mechanize loading, unloading and perform machining operations in addition to electro-forging at minimum labor cost.



Ask a T-W man about Electro-Forging.

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OAKVILLE AND WINDSOR, ONTARIO

A welded kitchen "in the clouds"

MUCH of the airline galley and food-service equipment used today is of welded construction.

The current news service bulletin of Oakite Products, Inc., New York City, graphically portrays some of the welding and cleaning processes used in the manufacture of such products as ovens, trays and liquid containers.

One of the firms in this business is Mansfield Aircraft Products Co., Mansfield, Ohio. The Oakite bulletin tells this story:

. . . Factors involved in choosing the proper metals were lightness in weight, their strength, corrosion resistance and ease of cleaning and sanitizing in use. Stainless steel and aluminum are used exclusively. . . .

Cleaning Aluminum

All aluminum components must be cleaned at various stages of fabrication and prior to inspection, assembly or for further treatment for spot welding. This operation is accomplished in a hot solution of a safe, inhibited alkaline cleaner, specifically developed for use on aluminum.

Aluminum equipment which is to be spot welded must be further processed. Because of partially soiled areas, for example, the aluminum oxide coating is of uneven thickness.

All surfaces must be reduced to a uniformly low resistance before the spot welder can be adjusted to give consistently strong welds at one setting. Controlled deoxidizing is accomplished by immersing the entire piece of aluminum in a room-temperature water solution of another specialized compound for a predetermined period, depending upon the alloy.

Stainless steel equipment is Tig (tungsten inert-gas) welded and special preliminary treatment is unnecessary. But heat discoloration after welding must be removed from areas surrounding the weld. This is accomplished with still another cleaning compound.

Iron & Steel Institute moves

The American Iron & Steel Institute, New York City, moved into its new quarters June 18. The Institute occupies the entire 38th floor in the building located at 150 E. 42nd St.

IN action, Carolyn really makes the sparks fly. Out from behind the mask (inset), she shows her most winsome smile.

A nominee for "prettiest weldor"

SHE'S NOT unique—we've written about women weldors before—but Carolyn Coven, of Toledo, Ohio, would certainly be right up there in a contest for the "prettiest weldor."

Only 4 ft 11 in. tall and weighing 85 lb, Carolyn was attending a vocational high school when the above pictures were taken. Since then, however, she has graduated to the apprentice ranks along with 18 males in her class.

Her instructor claims Carolyn, like most weldors of her sex, will probably tend to specialize. Women are not so good on all-around jobs as are men . . . it seems they become experts at horizontal fillets but neglect vertical and similarly more difficult welds.

However, the instructor (Clinton Wohlmuth of Macomber Vocational in Toledo) said girls have more rhythm in their work, leaving neater weld deposits.

Of course, by the time you read this, Carolyn might be married—last time we heard, she was going steady with (*what else?*) a weldor.

Silver anniversary for Chicago Welding Sales

Chicago Welding Sales Co., Chicago, is celebrating its silver business anniversary this year. Beginning in 1931, at the depth of the depression, the firm recently moved to a new location on Chicago's south side.

Easy-Flo's the ticket on this...

BELTLINE TO FAST, LOW-COST BRAZING

Moving right along 400 to 450 an hour, brass compressor valve bodies and tube adapter caps are brazed as they ride through the propane-oxygen heating section. All the girl does is assemble the parts with the ring of EASY-FLO 45 in place, (see left) brush on flux and set assemblies on the belt.

Similar setups can be readily devised for handling a wide variety of parts. We'll be glad to send a field engineer to help you work one up for your parts. No obligation.

READ ALL ABOUT IT IN BULLETIN 20...
It explains how and why the combination of properties you get in the EASY-FLO low-temperature silver brazing alloys, makes such fast, low-cost brazing setups practicable. Write for a copy today.

HANDY & HARMAN
ORIGINATORS OF EASY-FLO & SIL-FOS
HANDY & HARMAN FOUNDED 1867 CRAFTSMEN TO INDUSTRY

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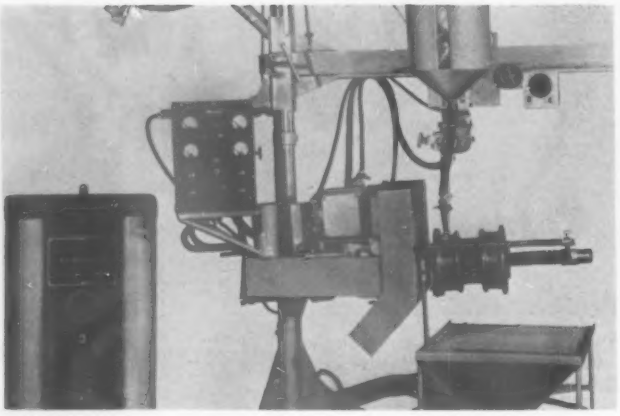
new products . . . . . USE CARD ON PAGE 107

X-RAY unit combines panoramic exposure, portability, and 360-deg tube for inspection.



VERSATILE automatic welder can be used for hardfacing, build-up, circular and longitudinal weldments. Flux supply is easily visible.

Portable X-ray

PANORAMIC exposures, combined with short exposure time and high quality radiographs, are said to be feature of portable X-ray set. The "Fedrex" is suitable for site, shop floor or laboratory work.

It has 360-deg X-ray tube encased in welded steel-clad tubehead. X-rays emerge in an angle of 20 deg direct through tubehead casing. Tubehead also contains transformers and oil cooling system. *Machinery & Welder Corp.*

Circle No. 1.

Hose crimper

CAPABLE of crimping ferrules on 3/16 and ¼ in. twin or single hose, hose crimper will splice one or both lines of twin hose. Tool is claimed to eliminate dangerous wire wraps or clumsy bolted clamps.

To use, insert ferruled end of hose in proper hole of tool and strike with hammer or press in vise. Make one quarter turn and strike or press again. Tool is available singly or with 8 splicers and 24 ferrules. *Craig Welding Co.*

Circle No. 2.

Catalog system

TAB-INDEX System of the National Welding Supply Association is now being made available to non-members.

Each set consists of an introduction and index to the system and 75 tab-division sheets. These division sheets are standard 8½ by 11 in. size, universal punched for easy insertion in salesmen's carrying cases and counter catalog stands. Tabs are printed in eleven different colors to conform with the eleven major classifications of the coding procedure.

The system is said to have other valuable uses in addition to cataloging—such as accounting, sales analysis and inventory control. *National Welding Supply Association.*

Circle No. 3.

Small grinding wheel

ONLY 3 in. in diameter, new model "Grind-O-Flex" coated-abrasive wheel is for contour polishing and grinding. It is only 2 in. wide, and is made in various grits from fine for polishing and buffing to coarse for deburring, smoothing flash and chamfering.

This smaller wheel is useful in working on sharp bends, contours of small radii and confined areas, as the inside of tubing. Simple to set up, it mounts on any spindle or chuck of portable or stationary equipment. *Merit Products, Inc.*

Circle No. 4.

Automatic welder

WELDER is for welding circular shapes as rollers, idlers, sheaves, crusher rolls. Claimed extremely versatile, "Rexarc RP-43" has automatic head able to operate on higher than normal welding voltage, resulting, states the manufacturer, in higher torque and faster speed response.

Rod-feed motor is designed for 110 volts. The "RP-43" controls welding operations and rotates work pieces simultaneously with stopping and starting of arc. All controls are housed in one cabinet.

Unit has high-frequency generator. The welder has 120-deg tilting table for positioning. Table can tilt from 30 deg below horizontal to vertical position. Unit has 100-lb. visible supply flux hopper. *The Sight Feed Generator Co.*

Circle No. 5.

Welding wire

AUTOMATIC welding wire is chrome-nickel-molybdenum alloy. Designated "A-S-8620," it has less than 2% total alloy content, states manufacturer. Wire is of standard AISI low alloy content. If base metal is of higher carbon, the carbon pickup from dilution in weld metal gives good wear resistance and high elongation, it is claimed.

With proper flux (submerged arc) on T-1 steel, wire gives tensile strength of 114/116,000 psi, elongation of 12-15%, Rockwell of C28-30. Wire is packaged in 100-lb coils and in individual fiberboard cartons. *American Chain & Cable Co. Inc.*

Circle No. 6.

Portable spot welder

HAND-HELD spot-welding head is for production line welding of small parts. "Weldpliers" are said to permit rapid precision welding in hard-to-get-at locations, thus are suited for electronic and electrical-component and wiring applications.

Unit weighs only 2½ lb and is designed with hand grip. Finger pressure applies constant welding force (adjustable from 1 to 25 lb) to workpiece.

Water-cooled electrode holders permit high-speed welding at powers up to 5 kva with a-c power supplies and 600 watt-seconds with d-c stored-energy supplies. Special electrodes are supplied with unit, which has overall length of 12 in.—minus electrodes. *Raytheon Mfg. Co.*

Circle No. 7.

Plastic fume hood

LIGHTWEIGHT, corrosion-resistant fume hood is made of polyester glass plastic. In addition to its light weight, other features claimed include: high-impact strength, ease of field fabrication, low cost. These are said to make it especially suitable for industrial fume-removal applications where highly corrosive materials are encountered. *Haveg Industries, Inc.*

Circle No. 8.

Portable X-ray

GAS-FILLED radiographic unit is capable of continuous operation at from 75 to 275 kvp and 9 ma, according to manufacturer. The "Resotron 275" features a resonant transformer for high-voltage power supply—eliminating heavy iron core of conventional transformers.

Portability—unit weighs 185 lb—is also promoted by use of sulfur hexafluoride insulating gas instead of oil insulation. Three basic designs are possible—as stationary unit; as self-contained unit made movable by bridge crane; as portable-mobile unit.

It is available with a trailer 6 ft wide by 8 ft long. Tube head, water cooler for anode, control and trailer weigh 2,600 lb combined. *General Electric Co.*

Circle No. 9.

GB Silver Brazing Alloys

Used in Many Hospitals Where Safety Means Life or Death

Sound, leak-proof joints are a MUST in hospital construction requiring the piping of Oxygen and Anesthetic Gases to wards, rooms and nurseries *for instant use!* That's why leading designers and contractors specify dependable GB Silver Brazing Alloys, Preformed Rings and Fluxes.

GB Preformed Rings, for example, assure stronger, safer everlasting joints. They save time, require less metal, meet all specifications, cost less. Perhaps life or death are not a factor when you do silver brazing, but the dependability, efficiency and economy provided in GB products are good reasons for their choice . . . especially when they cost so little.

. . . Shown above is typical installation of oxygen wall outlet, snap coupler and flow meter. GB Preformed Rings are used to braze (1) wall assembly to screen; (2) tube to regulator; and (3) tube to gauge. For complete data write today.

GB FLUXES are fully active, deep penetrating, stable and economical. Produced under strict laboratory control they are extremely effective in producing high quality joints.

GB PREFORMED SILVER BRAZING RINGS are available in a wide range of sizes for all requirements. They are easy to use, save time and labor, assure lasting results.

GB SILVER BRAZING ALLOYS are made in random coils, strips and many special shapes in addition to preformed rings. Also available is Goldsmith's Technical Service Division cooperation for competent assistance in all brazing problems.

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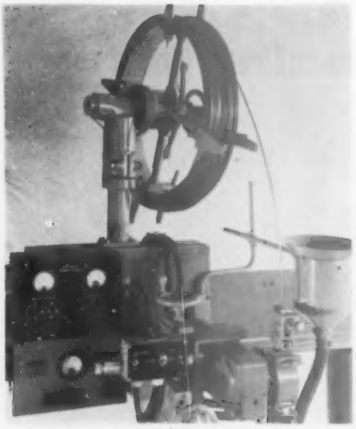


Welding heads

DESIGNED for submerged arc welding, new line of welding heads and assemblies are said to be adaptable to wide range of applications. The models are designated "UEH-1," "UEH-2," and "USH-2" welding heads.

The "UEH-1" welding assembly is for heavyduty use. It uses electronic voltage control, feeding wire to 5/16 in. diameter at current to 2,000 amp. The "UEH-2" uses electronic speed control for constant potential; "USH-2" uses standard arc voltage control. Both use wire to ¼ in. diameter, current to 1,200 amp. *Linde Air Products Co.*

Circle No. 10.

Temperature indicator

REDUCED settling characteristics are feature of improved line of "Tempilaq" temperature indicating liquids. By micronizing the solid ingredients (grinding to particle size of one millionth of 1 in.) settling has been greatly retarded, states manufacturer. Redispersing can be accomplished by brief shaking.

Sixty-two indicators are available, ranging in temperature rating from 113 to 2,000 F. With a few exceptions (true solutions) indicators consist of suspensions of temperature-sensitive materials in volatile vehicles, the rate of settling-out varying with the composition. *Tempil Corp.*

Circle No. 11.

Combination welder

GASOLINE engine-driven d-c arc welder has 6 kw or 12 kw a-c auxiliary power. Welder is available in 300 and 400 amp. Full capacity can be used to provide 110 or 220 volts or capacity can be divided between the two.

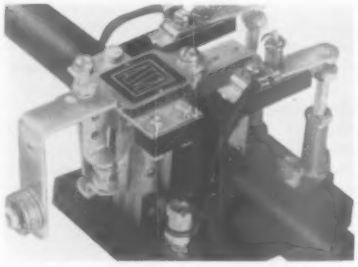
Welding control panel has current range hand wheel, volt-amp adjuster and welding cable connecting studs. Welder ammeter and voltmeter are optional. When welder and generator are in use at same time, 300-amp model can be used under combined load (d-c and a-c) 18 kw; 400-amp model can be used under combined load (a-c and d-c) 24 kw. *Hobart Bros. Co.*

Circle No. 12.

Power triode

TWIN power triode "Type 6080WA" is claimed ideal for use under adverse conditions. Tube plugs directly into any socket, using "6080" or "6AS7G"-series regulator tubes. Design includes mount of heavy duty parts, shock-insulated from the bulb by spring metal snubbers. *Chatham Electronics.*

Circle No. 13.



Welding relay

CURRENT type welding relay is designed to function like current transformer. Load cable through relay provides magnetic field. Coilless relay is primarily for continuous welding operations. Termed "1054-151S," relay is for a-c or d-c control.

Guide plates locate cable to relay; it can accommodate cable sizes to ⅞ in. OD. For d-c usage, special breaker piece clips are available. May be mounted in any position; cable passes through relay allowing easy installation, states manufacturer. Relay adjusted to pick up or close contacts at 130 amp, either a-c or d-c. *Automatic Switch Co.*

Circle No. 14.

Water control

WATER control is for use on pedestal, seam and flash welders up to 75 kva. Model "3801 Water Mizer" is a self-contained unit, mounts in water supply line at the welder; only two wires to connect, states manufacturer.

The "Hi-Lo" dual flow permits removal of trapped heat in slower cooling parts of welder. Makes possible water savings on ignitron contactors, using thermal-type flow switch, without flow switch rewiring, claims manufacturer. *Van Vooren Products.*

Circle No. 15.

Brazing, hardening

VERSATILE brazing, hardening, annealing, unit has turntable for either full or semiautomatic operation. Turntable unit burns, it is claimed, any commercial gas.

Work pieces to be heated (small parts, tools, etc.) are held by simple fixtures attached to power-driven turntable. They pass between two rows of burner nozzles as turntable revolves. Heat input is controlled by valve on manifold; heating time by variable speed drive on turntable. Burner manifold can be adjusted vertically and horizontally. *Gas Appliance Service Inc.*

Circle No. 16.

Solder-flux

PASTE solder combines tin-lead solder with an active flux. The "Swif Solder 50-50" can be applied with a brush or any standard applicator. It can be heated with soldering irons, torch or in production line ovens.

When heated, solder cleans, tins and solders in one operation, requiring only wiping with damp cloth to complete the job, states the manufacturer. Solder is available in 1½ oz plastic tubes, 4 oz jars, ½, 1 and 3 lb cans. *Hercules Chemical Co.*

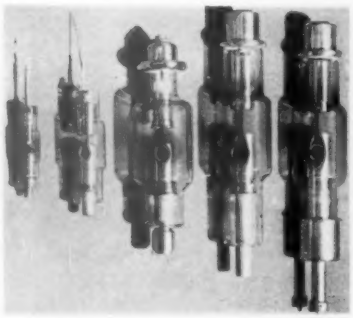
Circle No. 17.

Spot welder

SEAM and roll spot welder is aircraft type. Machine will seam or roll spot weld aluminum, magnesium and stainless steel alloys. Welder has electronic roll spot drive, universal electrode drive selection, built-in instrumentation, and worm and gear electrode drive mechanism.

The d-c motor is coupled to a gear reducer through an electric combination clutch and brake unit. Welder is three-phase frequency converter type. Unit can perform longitudinal and circular welding; also can be set up for upper or lower wheel gear drive. *Federal Machine & Welder Co.*

Circle No. 18.



Radiography

DESIGNED especially for lightweight, self-contained, portable X-ray tube heads (either oil or pressurized gas insulated) 5 new X-ray tubes are for use in 120 to 260 pkv range. Termed the "PR" series, these new tubes are claimed to provide compactness, strength and high energy ratings, combined with small focal spot. *Machlett Laboratories, Inc.*

Circle No. 19.

Arc welder

MACHINE is designed specifically for metal-arc welding. It can supply either a-c or d-c by flick of switch, claims manufacturer. Control circuit eliminates need for mechanical-type control; selenium rectifiers are designed for welding duty.

Both a-c and d-c welding ranges are wide; a rheostat gives micrometer current control within each range of the three-position switch. Machine is also equipped with a ball-bearing fan. Models are 200, 300 and 400 amp, with or without power factor correction. *Air Reduction Sales Co.*

Circle No. 20.

Electrode

ELECTRODE is for building-up carbon steel parts prior to hardfacing. The "Roll Matrix" electrode is alloyed to resist plastic deformation, upset and over-roll. Deposits (a-c or d-c) exhibit 30 Rockwell C hardness, cannot be machined or forged unless preheated to 400 F or red head respectively, states manufacturer.

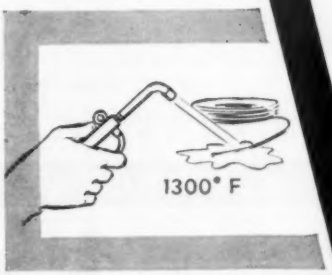
Electrode is not classed as hardfacing rod. It is made for application as the first stop in retreading carbon steel parts which have become excessively worn. It is intended to be overlayed with a harder alloy. Recommended practice is to rebuild to a point where not more than 1/4 in. thickness of hardfacing material is required. Electrode is available in 1/8 5/32, 3/16 and 1/4 in.-core diameters, packaged in 10-lb. containers, 6 to carton. *All-State Welding Alloys Co.*,

Circle No. 21.

Right down the line

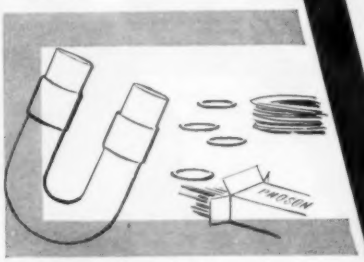
UNITED'S PHOSON alloys

Right every time for brazing copper and brass



Here's Why:

Lowest practical brazing temperatures. There's a Phoson Alloy to meet your every requirement.



Super-Strength—Corrosion Resistant. Joints are stronger than metals brazed. Original tensile from 86,000 p.s.i. Highly resistant to most types of corrosion and generally equal to copper itself.

Join better by brazing
Join best with PHOSON or SIL-BOND.

Choose Sil-Flux for every fluxing need.

High Capillary Attraction and Versatility. Provides outstanding free flow and deep penetration. Ideal for preplacement or face-fed application. Efficient in both tightly-fitted or more loosely-fitted joints. Phoson Alloys are available in straight lengths, coils or preformed rings. *Contact your United Welding Supply Distributor or write*

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AND SUPPLY CORP.
Brazing Alloy Division
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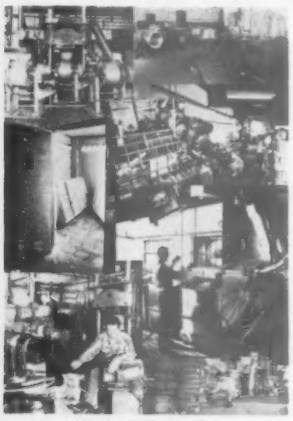
LOOK TO UNITED FOR THE BEST IN ALUMINUM, COPPER AND BRASS TUBE AND WIRE.

Alloys and Fluxes for joining and sealing



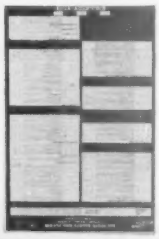
Typical views of ALL-STATE production facilities at White Plains plant

All-State ALLOYS AND FLUXES

EXPANDING Again!

New construction now nearing completion will add more than a third to ALL-STATE capacity to serve the "metal joinery" needs of industry with alloys and fluxes for welding, brazing, soldering, tinning and cutting.

Ask for "Buyers Guide"



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FROM 86 ALL-STATE PRODUCTS

Put one up in your supply room . . . another on your shop wall . . . to help guide selection of the right Alloy and Flux for the job at hand.

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ALL-STATE WELDING ALLOYS CO., INC., WHITE PLAINS, N. Y.

DIAL SET LEVEL

MARK A CENTER LINE *at any angle*

DIAL SET 45°

TO ESTABLISH AND MARK a point at any degree of angle on shaft, pipe or tube without numerous calculations or "cut and try" methods use the Boyce Centering Head. It's a must for welders, machinists, pipe fitters and boilermakers because it is *absolutely accurate* and saves time. Small enough to fit in your pocket, it weighs only 9 ounces. Order yours today or write for information.

CONTOUR MARKER CORP.
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MEASURE DECLIVITY

CHECK ANGLE BENDS

ESTABLISH BUTT-IN ANGLES

Boyce CENTERING HEAD

Cylinder mounting

CYLINDER mountings, termed "Universal," are claimed to end problems due to misalignment between air and hydraulic cylinders and their work loads. Mounting is available in two forms: hinge mount cylinder with mounting brackets at each end (illustrated above) and cylinder with trunnion and mounting bracket for rod end.

Mountings are used where cylinders move levers, gear segments or elements rotating about shafts. They allow cylinder to swing in same plane as object to which it is attached. *Hanna Engineering Works.*

Circle No. 22.

Elevator

SIMPLIFIED design is feature of "Hi-Lift Cableveyor" elevator. It is for use in elevating free-flowing materials, such as welding flux, plastic powder, gravel, foundry sand. It is available with 4, 8 or 12-in. diameter tubes, with center discharge chute for low speed of 60 fpm or side discharge for high speed operation to 250 fpm.

Unit consists of steel cable, carrying concave stamped or cast metal buckets, uniformly spaced by heavy springs under compression. Flexible connection joins cable ends. Unit has rubber-tired drive and take-up wheels. *Hapman Conveyors, Inc.*

Circle No. 23.

Belt grinder

BACKSTAND idler model "BS" is for abrasive-belt grinding, polishing and deburring. This unit, available for 4, 6, or 8-in.-wide belts, can be set up as belt idler for any grinding or polishing lathe, states the manufacturer.

Design features foot pedal for belt-tension release. Belt control is given through adjustable spring-loaded belt tension and tracking control. Unit can be mounted on floor, pedestal or wall, without use of adapters, for operations on right or left side of polishing lathe. Unit will compensate for belt length with use of different diameter contact wheels. Remote tracking control and pneumatic tensioning also available. *Curtis Machine Corp.*

Circle No. 24.

AIRCO

WELDING and BRAZING *Hints*

PROBLEM:

To gas weld steel

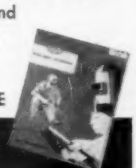
SOLUTION:

Airco #1 Alloy Steel Rod. Designed for welding low carbon and low alloy steels. Provides high ductibility in "as welded" condition when welding with a neutral flame or with a slight excess of acetylene. It is smooth flowing, insuring good control of molten pool. Recommended for all general pipe and plate welding, aircraft structures and maintenance work.

Airco #4 High Tensile Welding Rod. Whenever current codes and product specifications allow the use of a lower priced, high strength rod, Airco #4 will meet all specifications. This rod is for producing welds in low alloy steel requiring minimum tensile requirements of 62,000 psi.

Airco #7 Mild Steel Rod. This low priced general purpose welding rod is popular in job shop and maintenance work for welding low carbon steel. In using this rod it is suggested that the weld metal pool be worked so as to include a fair amount of base metal in the mixture.

Send for this free catalog!
You'll find here the finest rods and fluxes for joining both ferrous and non-ferrous metals. Write Airco at address below.



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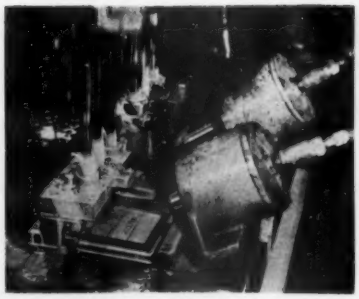


Air lock

AIR fixture lock is claimed to provide split second clamping on variety of applications. Unit can be mounted on a fixture to lock work in position for drilling. Other applications include moving one part of a fixture against another; pushing work pieces into cutters; loading or ejecting work pieces automatically; pressing parts into a work piece; moving parts of a machine.

Air cylinder of fixture lock can receive five interchangeable holding tools. Cylinder can be mounted in any position, moved from job to job, and used with specially made holding tools. Three sizes of cylinder available have rated locking forces from 650 to 2,300 lb psi, power strokes from 1⅞ to 3⅛ in. *Wilton Tool Mfg.*
Circle No. 25.

Engine-generator

IDLING control for reducing speed to idling is feature of "Winco" 2,500 watt direct drive engine-generator. Idling control "CONSERV-er" is said to conserve fuel, and reduce maintenance.

The engine-generator, termed "Series 205B14S2D," is designed to give close, steady voltage regulation. Optional features are indicator pilot light, two-wheeled dolly, and retractable starter. *Wincharger Corp.*
Circle No. 26.

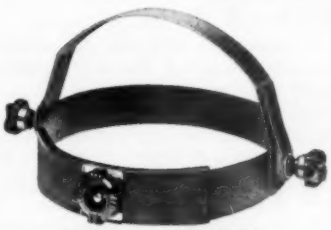
Dust collector

DESIGNED for quiet operation, exhaust silencer is for use on cabinet-type dust collectors. The silencer is available in five models, to fit exhaust openings on the "50", "60", "70", and "80" series and the "Model 122" collectors.

The three smaller models are made of 20 gage steel, extending 30 in. above collector top. Larger two models are of 16 gage steel, extending 36 in. All five are rectangular in cross-section, interlined with 1 in. closed cellular vinyl foam, said to absorb 8% of noise without restricting air flow. *Torit Mfg. Co.*
Circle No. 27.

EXTRA LONG for Extra Protection!

No. 231 Helmet



Sel-O-Matic positive locking ratchet type headgear.

SELLSTROM'S No. 231 R FIBER GLASS WELDING HELMET

Comfortable fitting, straight front helmet of one piece compression-molded Fibre Glass. *EXTRA LONG TO PROTECT NECK AND CHEST—large curved top fully protects frontal head area during ALL welding operations!* Tough; lightweight; easily cleaned; won't warp!

Write for brochure which gives complete information and prices on the No. 231 R helmet. Or send for data and prices on Sellstrom face shields, respirators and other Safeguards.

Distribution in all important cities.

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MANUFACTURING COMPANY

Eye and Face Safeguards Designed for Utmost Comfort

226 Hicks Road **Palatine, Ill.**

engineering research. His activities have included design of elevated steel water tanks, steel buildings, wind tunnels and many other structures. He has originated and directed research in over 1,000 projects, covering storage of chemicals, to nature and intensity of stresses. His work has included complex metallurgy of electric arc welding of various metals, including the designing and testing of welded joints.

A holder of over 30 patents, Mr. Jackson has written numerous articles and papers. He is a member of the American Welding Society, the American Society for Testing Materials. He has been a member since 1930 of the welded tank committee of the AWS and is active on numerous other association committees.

MODERN namesake of famed Indian maiden, Princess Pocahontas, portrayed by Dot Sutherland, helps John Strother, rear (All-State Welding Alloys Co., Inc.), distribute literature at coal show. (See story below.)

New plant for Fischer & Porter

Construction of a new office building for Fischer & Porter Co., Hatboro, Pa., began recently by groundbreaking ceremonies. Kermit Fischer, president, turned over the traditional first spadeful of earth.

The new two-story building will have over 91,000 sq ft of space. It will be completely air conditioned. In addition to office space, the new building will increase floor space in the manufacturing plant.

Lift-slab construction, in which the roof and each floor are laid on the ground and then raised to their respective heights, will be utilized. The exterior walls will be yellow, porcelain-coated aluminum panels.

Cooper Alloy Corp. expands facilities

Cooper Alloy Corp., Hillside, N. J., has begun expansion of its facilities both at its Hillside and Clark Township, N. J. plants. Construction of the new building is scheduled for completion at the Hillside addition this summer and at Clark in early fall.

The Hillside expansion will provide 7,800 sq feet of expanded foundry area. At Clark expansion will increase facilities for production of rolled and welded aircraft rings.

Welding conference to be at Boston

A group of six welding experts will speak before the New England Regional Conference on Welding to be held Sept. 19 at New England Mutual Hall, Boston.

The conference has been planned by the Boston Section of the American Welding Society with the aim of providing better exchange of technical ideas on a regional basis.

Topics for discussion will include recent advances in welding electrodes, mechanism of brazing, weld crack susceptibility tests, fabrication of titanium, welding with CO_2. The program of six sessions will be followed by a social hour and dinner.

Airco opens new sales office

The Air Reduction Sales Co., New York City, has opened a new sales office and warehouse in Denver. Welding gases, oxyacetylene, arc and inert gas welding equipment and supplies will be provided at the new facility, located at 2636 Walnut St.

RWMA new orders continue gain

April statistics compiled by the Resistance Welder Manufacturers' Association again reflects considerable gain for 1956 when compared with last year.

New orders totaled $3,500,000, making April the fourth consecutive month in which new business has been at a new high. The first four months of this year show an increase of 89% over the same period of last year.

Shipments during the same period show an increase of 21% over the first third of last year. The backlog of orders on hand at end of April is said to be almost $22,000,000.

Bluefield Coal Show hits record attendance

Attendance at the three-day Bluefield Coal Show reached more than 62,000 persons, all eager to see the numerous exhibits and demonstrations. Held in Bluefield, W. Va., the show was sponsored by the Pocahontas Electrical & Mechanical Institute and various Bluefield mine and mill supply houses.

More than 325 firms and manufacturers were represented with several welding electrode and equipment manufacturers present among the exhibitors.

Aimed at showing the coal industry and related industries equipment and machinery currently available, the show also included exhibits of general interest to a visitor.

Contests and prizes, as an exhibit of fossils from the coal mines, were a feature of the three-day program as were the visits of various dignitaries, including the governor of Virginia.

Present at the show was Princess Pocahontas, living trade mark of the Pocahontas Welding Supply Co., Bluefield, who represented the firm at its booth.

Van Straaten Chemical in new building

The Van Straaten Chemical Co., Chicago, has moved its sales headquarters and main laboratory into new quarters at 630 W. Washington Blvd., in that city. The company produces industrial cutting, grinding and metal-cleaning compounds.

Jayne Mansfield named Miss Weldor

Stage, screen and television star Jayne Mansfield was recently elected Miss Weldor of 1956 by the National Eutectic Weldor's Club, Eutectic Welding Alloys Corp., Flushing, N. Y.

Currently acclaimed as "the most photographed girl in the world" and the subject of a recent color feature in a national magazine, Miss Mansfield joins such illustrious former Miss Weldors as Dorothy Malone, Sophia Loren, Denise Darcel and Dagmar.

The two poses selected of beautiful Miss Mansfield are available from the National Eutectic Weldor's Club, Flushing, N. Y.

Machine tool forum reveals latest trends

Interest in new manifold materials, latest trends in fittings, filter system design was exhibited at the Production Machine Tool Hydraulic Forum held recently under the sponsorship of Vickers Inc., Detroit.

The conference, held in the Engineering Society of Detroit building, was attended by more than 175 design, maintenance and service engineers representing 111 manufacturers and users of production machinery, machine tools and automation equipment.

Keynote speaker was Louis Polk, president of the National Machine Tool Builders Association. He pointed out that advances in any field must depend on the ability of our machine tools to produce required components to ever increasing closer tolerances. (See WELDING ENGINEER, May, 1956, p. 131.)

Importance of grinding wheels stressed

The grinding wheel industry was described recently as a modern Atlas supporting the free world. Grant S. Diamond, speaker at a three-day conference of the Grinding Wheel Institute at Boca Ration, Fla., pointed out that grinding wheels are basic industrial tools. Mr. Diamond, president of the Institute and of Electro Refractories & Abrasives Corp., Buffalo, N. Y., predicted grinding wheel production figures for this year will top those of last.

Beryllium Corp. opens new warehouse

The Beryllium Corp., Reading, Pa., has opened a new warehouse at 17187 Wyoming Ave., Detroit.

M38 Torch beginning cut in wooden "two-by-four". Note how intense heat envelopes head of torch.

Note unchanged condition of torch head after "two-by-four" has been penetrated.

This test proves that
K-G TORCHES
have "what it takes"!

Cutting through a wooden "two-by-four" is a tough test for any torch. Yet, as shown in the two photographs, our M38 Torch came through with flying colors.

Wood, unlike metal, conducts heat very slowly away from the cut. The concentrated heat reflects backward over the head of the torch. The Monel head of the M38 Torch resists distortion from this intense heat and the gas passageways remain operative.

It will be found even after such an extreme test as this that the M38 head will still take a new cutting tip. NO DISTORTION HAS OCCURRED.

If you want the best in cutting and welding torches call your K-G Distributor, or send for 24-page catalog.

The K-G Equipment Co. (Inc.)
Dept. A 1744 Lehigh St., Allentown, Pa.

AT THE FRONTIERS OF PROGRESS YOU'LL FIND

AN AIR REDUCTION PRODUCT

FOR WELDING AND CUTTING...

IN THE RED DRUM

HIGHEST QUALITY

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Write for the name and address of the NATIONAL CARBIDE supplier nearest you.

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THIS IS LOW COST WELDING!

When a touch on a button moves weldments like these into the correct, most convenient position for a downhand pass, you get more arc time, more welding at lower cost. C-F power operated Positioners rotate the work in a full circle at any point in a range of 135° from the horizontal—giving welders a choice of an infinite number of downhand welding positions instantly.

Every requirement for faster, better positioned welding—constant or variable speed table rotation, full 135° tilt, self-locking gearing which holds the table in any position, oversize built-in main tilt, and rotating bearings, choice of two base styles, and many other features—are built into C-F Positioners.

C-F Positioners are available in Hand or Power operated models, and are made in capacities up to 30,000 lbs. and larger.

Write for the new C-F Positioner Catalog

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C-F positioned welds mean better, more economical welds

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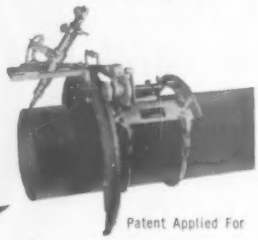
OF PIPE CUTTING AND BEVELING MACHINES OFFERING

A *COMPLETE RANGE* of 1½" to 36" in *DIAMETER!*

• EASY TO OPERATE • LIGHTWEIGHT • RUGGED • DURABLE • ACCURATE • PROFITABLE • EFFICIENT • PORTABLE • SPEEDY



Patent Applied For

Again, H&M paces the field by providing the only complete line of lightweight, portable pipe cutting equipment based on the famous H&M horseshoe split gear principle, with models for 1½" to 4" — 4" to 8" — 8" to 12" — 14" to 20" — 22" to 26" — 26" to 30" — 28" to 36"! Write today for fully illustrated details on the full H&M line.

H&M PIPE BEVELING MACHINE COMPANY

TULSA, OKLAHOMA

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COMING EVENTS

SEPT. 17-21: Eleventh Annual Instruments-Automation Conference & Exhibit, Instrument Society of America, Coliseum, New York City.

SEPT. 19: New England Regional Welding Conference, American Welding Society, New England Mutual Hall, Boston.

SEPT. 20-21: Eastern Zone Meeting, National Welding Supply Association, Hotel Statler, New York City.

SEPT. 24-25: Central Zone Meeting, National Welding Supply Association, Hotel La Salle, Chicago.

SEPT. 24-28: X-ray Diffraction School, North American Philips Co., Inc., Sir Francis Drake Hotel, San Francisco.

SEPT. 24-28: Trade Fair of Atomic Industry, Atomic Industrial Forum, Inc., Navy Pier, Chicago.

SEPT. 25-27: Third Annual Atomic Industrial Forum Conference, "Management & Technology for Atomic Industry," in conjunction with Trade Fair, Morrison Hotel, Chicago.

OCT. 8-12: National Fall Technical Meeting, American Welding Society, Cleveland.

OCT. 8-12: Thirty-eighth National Metal Exposition and Congress, Cleveland Public Auditorium, Cleveland.

OCT. 22-26: National Safety Congress and Exposition, Chicago.

OCT. 29-30: West Central Zone Meeting, National Welding Supply Association, Hotel Nicollet, Minneapolis.

NOV. 1-2: Western Zone Meeting, National Welding Supply Association, St. Francis Hotel, San Francisco.

DEC. 3-4: Southeastern Zone Meeting, National Welding Supply Association, Dinkler-Tutwiler Hotel, Birmingham, Ala.

DEC. 6-7: Southwestern Zone Meeting, National Welding Supply Association, Statler-Hilton Hotel, Dallas.

JAN. 28-31, 1957: Eighth National Plant Maintenance & Engineering Show, Cleveland Public Auditorium, Cleveland.

JAN. 30-31: Midwest Welding Conference, Armour Research Foundation of Illinois Institute of Technology, Chicago.

APRIL 8-10: Fifty-seventh Annual Convention, International Acetylene Association, Hotel Nicollet, Minneapolis.

APRIL 8-12: Fifth Spring and Thirty-eighth Annual Meeting, American Welding Society, Hotel Sheraton, Philadelphia.

APRIL 9-11: Fifth Annual Welding Show, American Welding Society, Convention Hall, Philadelphia.

MAY 13-16: Thirteenth Annual Convention, National Welding Supply Association, Hotel Mayflower, Washington, D. C.

Adds facilities for welded wire fabric

American Steel & Wire division, United States Steel Corp., New York City, has begun construction of a new welded wire fabric mill. When completed, the 53,000-sq-ft mill will add 40,000 tons of finishing capacity annually to the division's Cuyahoga Works in Cleveland.

Eastern Welding in new quarters

Eastern Welding Equipment Co., Inc., has moved into its new and larger quarters at 775 Old Country Rd., Westbury, L. I., N. Y.

Advise ceramics for high temperatures

Ceramic tools, jigs, fixtures and parts offer manufacturers new possibilities for meeting demands of high temperature usage, according to Technion Design & Mfg. Co., New York City.

Heat-resistant ceramics, able to withstand high temperatures (above 2,000 F) extreme thermal shocks and abusive wear conditions, are often the key to automation of brazing, heat treating and allied operations where metals or plastics cannot offer consistent performance.

Ceramic jigs, such as "Sur-Braze Grade HT-2" fired plates manufactured by Technion provide ceramic material claimed almost as hard as carbide. This jig material is claimed able to withstand severe oxidizing conditions and can be quenched from 2,400 F, without spalling.

A typical recent application of ceramic jigs has permitted autocarbide tool bit production. A specially designed ceramic holder maintains correct tip alignment through preheat, brazing and cooling. Tool bit production was increased by 25%, states Technion. Thus as a carrier in an automation process, such ceramic materials can convey assemblies from beginning to end through cleaning processes as well.

Distributor appointments

Alloy Rods Co., York, Pa.: The U. S. Welding Supply, Inc., Casper, Wyo.; Merritt Holland Welding Supply, Wilmington, N. Car.; H R Supply Co., Billings, Mont.; Tulsa Welding Supply, Tulsa, Okla.; Oxygen Service & Supply Co., Santa Rosa, Calif.; Valley Supply Co., Ottumwa, Ia.

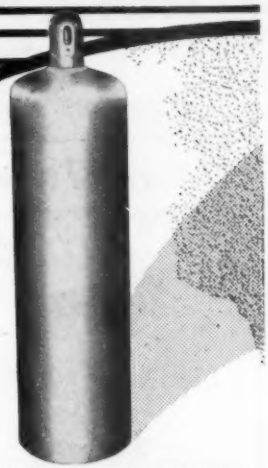
Ampco Metal, Inc., Milwaukee: General Welding Supply Co., Mineola, N. Y.; Franson Welding Supply Co., Brooklyn.

Carboloy Department, General Electric Co., Detroit; Farmers Supply Co., Paintsville, Ky.

Nelson Stud Welding Division, Gregory Industries, Inc.: Fuchs Machinery & Supply Co., Omaha, Nebr.; Sioux Machinery & Supply Co., Sioux City, Ia.

Norton Co., Worcester, Mass.: Rudel Machinery Co., Inc., New York City.

COYNE ACETYLENE CYLINDERS



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in Every Way . . .
OUTSTANDING

COYNE ACETYLENE CYLINDERS ARE UNSURPASSED IN SAFETY, RUGGEDNESS, QUALITY OF WORKMANSHIP AND ACETYLENE CAPACITY. EACH STAGE OF MANUFACTURE IS CLOSELY SUPERVISED BY HIGHLY TRAINED TECHNICIANS WITH MANY YEARS OF EXPERIENCE IN THE ACETYLENE CYLINDER AND ACETYLENE GAS INDUSTRY. ALL CYLINDERS EXCEED INTERSTATE COMMERCE COMMISSION SPECIFICATIONS ICC 8 AND ICC 8 AL.

WRITE DEPT. A-3 FOR SPECIFICATION SHEET AND PRICE LIST

COYNE CYLINDER COMPANY
TWO PLANTS TO SERVE YOU
200 PAUL AVE. SAN FRANCISCO 24, CALIF.
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cut weld cleaning time by 85%

Throw away your cold chisel and whisk off weld spatter with a dry rag! Protect-O-Metal spatter-proofing compounds make weld cleaning a breeze. Improve your welds at the same time — P-O-M compounds quiet the arc, improve fusion and electrode operation, prevent oxidation and annealing scale, cause no porosity. No smoke, odors, or fumes.

P-O-M No. 2. Non-inflammable, non-toxic, water-soluble paste. Inorganic. Thin before applying and start welding at once. $3.30 per gallon, f.o.b. Dayton.

P-O-M No. 8. Rust- and corrosion-resistant resin base compound. Comes ready to use. Safe for all metals. Good paint primer; permits outdoor storage of subassemblies. $3.35 per gallon, f.o.b. Dayton.

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Order a trial gallon of each today for testing in your shop. We'll cancel the bill if you're not satisfied.

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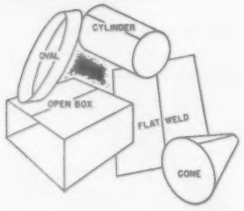
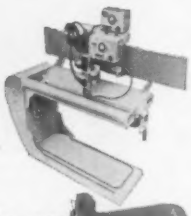
THESE TWO FIXTURES CAN GIVE YOU ACCURATE – SMOOTH – PRESSURE TIGHT Fusion Butt Welds

If you make these →

You need these →





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Longitudinal Welding Fixture

Manufactured in 2 ft. to 12 ft. lengths. "Toe touch" control permits controlling fingers from any position. Welds sheets, cones, cylinders, boxes, etc., from .010 to one inch thickness. Suitable for MIG, TIG, submerged-arc and hand welds. Available also as complete package.

AIRLINE MODEL R 4000
Planishing Roll—60 Inch Throat

High Roller Face Pressure. Cold works welds and adjacent areas, flattens and smooths fushion welds, increases mechanical properties, reduces grinding. Also flattens flash welds, mash welds, resistance welds and elongated weld areas. Diameters 1¼ in. to 10 ft., and to 10 ft. lengths on large diameters.

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Fast! Accurate! Easy!

This compact machine tests spotwelds, strip, wire, anything within its 20,000 lb. capacity. Hydraulically powered, it has an easily controlled ram, self-acting specimen grips that are open sided for easy specimen insertion. This tester, Model ST-1, is adjustable to take specimens 5" to 9" in length. Various load gauges, grips, and other modifications are available.

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9380 Grinnell Ave., Detroit 13, Mich.

Stanley E. Fey has been appointed to the newly-created position of general manager, cylinder gas division, by Air Products, Inc., Allentown, Pa. He will direct operations for the company's six generating plants. Mr. Fey has made many contributions to the gas industry, including pioneer work on lighter-than-air aircraft.

Eugene Salinger has been named general manager of the Henry Disston division, H. K. Porter Co., Inc., Philadelphia. He succeeds *Lawrence L. Garber*, who has been named to the newly created position of vice-president in charge of production for H. K. Porter. Mr. Garber will headquarter in Pittsburgh while Mr. Salinger will be located in Philadelphia.

E. L. Mathy was recently appointed chairman of the board and president and general manager of National Welding Equipment Co., San Francisco. Before joining National several years ago, he was vice-president of Victor Equipment Co., San Francisco, for nearly 20 years. Mr. Mathy has been active in the welding field for more than 40 years.

Bela M. Ronay, formerly superintendent of the welding laboratory, U. S. Naval Engineering Experiment Station, Annapolis, Md., has established business as a welding consultant in Annapolis. Mr. Ronay joined the thermit division of the Metal & Thermit Corp. in 1915. After service in the first world war, he was named head of the engineering department in charge of research. In 1931 he organized the welding laboratory of the naval station, which post he held until his recent retirement June 15. He has been responsible for many developments in the welding field, including weldors' tests, induction heating, thermal shock tests. He is a member of the American Welding Society.

Carrigan

Krestakos

W. H. Carrigan has been appointed vice-president and general manager, and *J. J. Krestakos* has been appointed sales manager by Kirkhof Mfg. Corp., Grand Rapids, Mich. Both will headquarter at the new Kirkhof plant in Grand Rapids.

Les Gooch, sales manager for the past two years of the safety division, Sellstrom Mfg. Co., Palatine, Ill., has been appointed sales manager of the welding division. In his new post Mr. Gooch will supervise sales of both divisions.

William R. Wherry, welding consultant, is celebrating his 40th year in welding sales and engineering. In 1917, Mr. Wherry was the first man to have a welded tank approved in the New York City area. He is located at 921 McLean Ave., Yonkers, N. Y.

David M. Kasson has resigned as sales manager of Kasson Die & Motor Corp., Long Island City, N. Y. Earlier this year he became president and general manager of Brennen, Bucci & Weber, Inc., New York City.

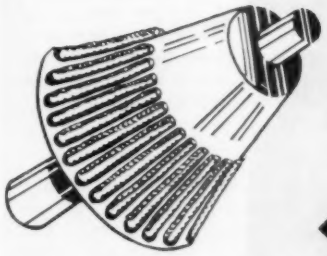
Archibald C. Hallock has been appointed X-ray field engineer by Machlett Laboratories, Inc., Springdale, Conn. His first assignment with the company places him in the central states area, with headquarters in Chicago.

Recently appointed to the sales staff of Hoeganaes Sponge Iron Corp., Riverton, N. J., were *Fred W. Bulach*, *John K. Grube*, *E. M. Lannes*, *J. K. Taylor* and *W. C. Gibbs*.

Robert W. Bowers has joined the sales department of The Fibre-Metal Products Co., Chester, Pa.

David D. May has been appointed factory sales representative by Modern Engineering Co., St. Louis, Mo. He will represent the Meco oxyacetylene welding and cutting apparatus divisions. He will headquarter in Memphis, Tenn.

BE WISE! ECONOMIZE!



Rebuild
GYRATORY CRUSHERS
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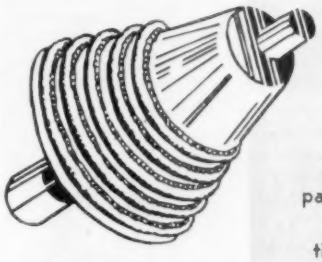
MANGANAL
Trade Mark Reg. U. S. Pat. Off.
11%-13½% MANGANESE-NICKEL STEEL
ROUND APPLICATOR BARS



Tough Manganal usually outlasts new parts. Workhardens under impact and abrasion, too. That means less downtime, more worktime for your gyratory crushers.

Send for time-saving "how-to-do-it" bulletin.

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NEAREST DISTRIBUTOR UPON REQUEST

Where a few POUNDS mean more than a few YEARS

Safety and *long life* are prime considerations in the design of Harrisburg High Pressure Gas Cylinders. Yet they are as light as sound engineering permits, without a pound of excess weight. True, we might shave off a few more pounds, but it would entail shaving off more than a few years from their life expectancy.

Industry expects a quarter-century or more of safe service from compressed gas cylinders, based on long experience with the Harrisburg product. Industry can continue to do so, for Harrisburg Cylinders will always be built for a long and safe future. Send for prices and literature.

More than a century in Harrisburg
Harrisburg Steel Co.
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Lepel

HIGH FREQUENCY
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HEATING UNITS

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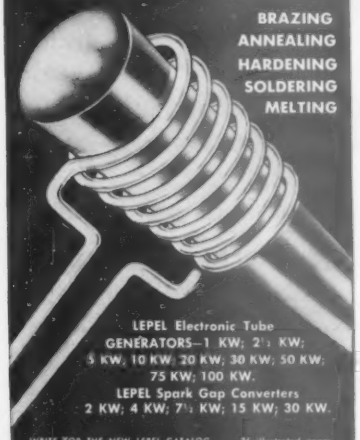

LEPEL Electronic Tube GENERATORS—1 KW; 2½ KW; 5 KW; 10 KW; 20 KW; 30 KW; 50 KW; 75 KW; 100 KW.
LEPEL Spark Gap Converters 2 KW; 4 KW; 7½ KW; 15 KW; 30 KW.

WRITE FOR THE NEW LEPEL CATALOG . . . 36 illustrated pages packed with valuable information.

All Lepel equipment is certified to comply with the requirements of the Federal Communications Commission.

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Charles L. Holbert has been appointed executive vice-president of H. K. Porter Co., Inc., New York City. Mr. Holbert, who will be operating head of Porter, succeeds *Clarence R. Dobson*, who has retired. Before joining the company, Mr. Holbert was executive vice-president of the Southern Pacific Milling Co., Ventura, Calif. Mr. Dobson will serve as consultant to the company.

Albert J. Fischer has been appointed works manager of Adamas Carbide Corp., Kenilworth, N. J. He was formerly director of research and development. *Michael J. Kniola* has been named production manager. He was formerly associated with the Carboloy Department of General Electric Co.

H. D. McLeese has been elected a vice-president of Metal & Thermit Corp., New York City. As vice-president he will direct sales, market development and research and advertising of all Metal & Thermit and United Chromium products. Named general sales manager in May, 1955, he continues as the company's chief sales executive.

Howard J. Bowman has been named director of research and development for Trent Tube Co., East Troy, Wis.

Edward Renz has been appointed sales representative in the Chicago territory for Alloy Metal Wire Division, H. K. Porter Co., Inc., New York City. He will be located in the Chicago office.

Harry E. Mitchell, former tool supervisor, Beech Aircraft Corp., Wichita, Kan., recently joined Carboloy Department of General Electric Co., Detroit, as a carbide tool sales representative in the Midwestern district. He will headquarter in Tulsa, Okla.

Died . . .

John L. Slade, administrative assistant to the vice-president of The Black & Decker Mfg. Co., died June 1 at his home in Hampstead, Md. Mr. Slade, who was only 33, had served as manager of the portable-electric-tool firm's Hampstead plant until May, 1954. He is survived by his widow and a daughter.

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Gloves—Garments

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BRAZILIAN DEERSKIN THE "STAY SOFT" LEATHER GLOVES AND MITTENS

TILLMAN PRODUCTS
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Make More Money on EVERY Welding Job . .

METAL BOND
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PRODUCTS

We have been making Metal Bond Products for more than 25 years and successful Welders all over the country have been using them to advantage

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- Make your own test—also send for our pocket-size catalog which contains information and descriptions of our money-saving METAL BOND Products.

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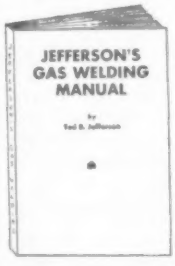
JEFFERSON'S GAS WELDING MANUAL
by Ted B. Jefferson



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- 67 Illustrations
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America's newest gas welding book and the only book with—

- Jiffy Welding Guides
- Jiffy Flame Cutting Guides
- Jiffy Joining Chart

Other chapters on How to Weld; How to avoid Defective Welds; Flame Cutting; Flame Treating and Useful data for the Welder.

Order from your
Welding Supply Distributor
or
Welding Engineer
12 E. Grand Ave., Chicago, Ill.

30 YEARS AGO

(Taken from *The Welding Engineer* of July, 1926)

A feature article describes welding in a jungle—the experiences of an oxyacetylene weldor in the Fiji Islands, sent to repair the cast-iron flywheel of an oil engine off a 250-ton schooner.

— 30 YEARS AGO —

C. A. Cotton, Boston, has been appointed district sales agent for the New England territory by Burke Electric Co., Erie, Pa.

— 30 YEARS AGO —

The Reid-Avery Co., Inc., Philadelphia, has opened its modern wire drawing mill at Sparrows Point, Md.

— 30 YEARS AGO —

The first all-welded water pipeline, reported to the first in this country and also the longest pipeline of its type, was recently completed for Vallejo, Calif.

— 30 YEARS AGO —

F. L. Smith Co., Elizabeth, N. J., has initiated welding in many operations in its factory where formerly riveting was employed.

— 30 YEARS AGO —

Prospect Boiler Works, New Brunswick, N. J., has installed an arc welder and air compressor in a bus for field welding.

— 30 YEARS AGO —

The Gibb Welding Machines Co., Bay City, Mich., has begun construction of an addition to its factory.

—30 YEARS AGO—

W. A. Ownes has joined the sales organization of C. H. Hollup Corp., Chicago.

"Good grief, Simms! Don't we have any C clamps around here?"

SAVE TIME AND MONEY!

A SMOOTH SWING of the Contour Marker's soapstone point and you're ready to cut! It's easy and *absolutely accurate* because there is an angle dial calibrated in both degrees and pitch. Any of the pipe joint angles shown can be marked off in minutes. And you save "man hours" as well as oxygen and acetylene gas because "cut and try" methods are completely eliminated. Two sizes are available complete with adapter for marking structural steel. Standard, for pipes from 1½" to 18" dia.; Jumbo, for pipes from 16" to 48" dia. Instruction book included. Belt case available. Write for information

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- better top-of-head protection
- easy fit in your toolbox
- scientific upward ventilation
- longer helmet life

Specify the complete line of quality-built, guaranteed products

HUNTSMAN "face savers"
WELDING HELMETS, FACE SHIELDS & ACCESSORIES
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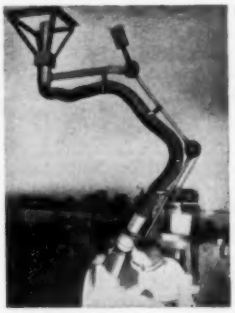
Weld-O-Vent
"World's Finest Exhaust Systems"
Welding Fume Exhausters
MANY EXCLUSIVE FEATURES



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- Portable and stationary units for all applications.
- Unlimited flexibility, fast, easy positioning, over 360° radius.
- Blowers can be attached to units or mounted at remote points connecting with ductwork.
- Units can be connected in series.

Available in 9, 12, or 16 feet reach units.

Write For New Application DATA . . .

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free literature . . . . . card on page 107

51. RADIOGRAPHY—E. I. du Pont de Nemours & Co., Inc. 24-page illustrated catalog (A-9234) discusses industrial radiographic inspection, describing X-ray films, discussing characteristic curves, processing chemicals, etc.

52. GRINDING WHEELS—Precision Grinding Wheel Co., Inc. Sheet describes and illustrates "Tuf-Cut" saucer-shaped grinding wheel, with operating speeds and sizes.

53. WELDERS, POSITIONERS — The Webb Corp. 27-page, illustrated bulletin 88 outlines types of welders, turning rolls, positioners.

54. WELDER CONTROL—Thomson Electric Welder Co. 4-page illustrated folder treats the "Cali-Matic" single knob control for spot, projection welders.

55. FLAME-CUTTING—Speedi-Burn Products Co. 4-page leaflet, with illustrations, discusses bar stock and pipe cutting flame-cutting machines.

56. PLASTIC WELDING—American Agile Corp. Latest issue of *Plastics Weldor and Fabricator* discusses plastic welding applications.

57. RESISTANCE WELDING — Sciaky Bros., Inc. Bulletins 338 and 339 present technical, operation and application data about electronic counter weld control.

58. WELDOR'S APPAREL—C. D. Genter Co. 4-page booklet gives illustrations and uses of aluminum impregnated asbestos safety apparel, including aprons, suits, special headgear.

59. BRUSHES, SAWS—Anderson Corp. 32-page illustrated catalog No. 55 shows complete line of wire brushes and hole-cutting saws, aids to selection.

60. ELECTRODES—The Lincoln Electric Co. "Weldirectory for Mild Steel & Low-Alloy High-Tensile Steels" (SB-1351) includes iron powder and other electrodes. Bulletin gives description of electrode, properties, recommended welding procedures.

61. HOSE ACCESSORIES—Hose Accessories Co. Bulletin 110 presents, with illustrations, "Le-Hi" steel, malleable iron and bronze, air hose couplings, valves and manifolds.

62. NICKEL-CLAD WIRE—Alloy Metal Wire Division. Technical bulletin T-3 presents engineering and application data on nickel-clad copper wire, combining electrical and heat conductivity of copper with heat and corrosion resistance of nickel.

63. WELDOR'S HELMET — The Fibre-Metal Products Co. Illustrated bulletin No. 47 presents, in detail, new lift-front fiber helmet.

64. ELECTRODE HOLDER—Tweco Products, Inc. Catalog sheet illustrates and discusses "AL-300" lightweight aluminum electrode holder, with specifications.

65. METALLIZING GUN — Metallizing Engineering Co., Inc. Color, illustrated leaflet outlines construction, operation and use of "Type P" metallizing gun, said to permit thermal spraying without use of compressed air.

66. BUTT WELDING — Airline Welding & Engineering. Bulletin No. 101 describes butt welding sheet metal structures, with illustrations.

67. WELDED REPAIRS—Eutectic Welding Alloys Corp. Farm repair wall chart (TIS 2593), printed on heavy paper, shows how to repair equipment, gives repair techniques.

68. BUYERS' GUIDE—General Electric Co. 20-page bulletin (GEC-1033) covers welding equipment, electrodes, accessories of this firm. Ratings, dimensions, specifications are given.

69. RADIOGRAPHY—Philip A. Hunt Co. Color brochure describes liquid X-ray developer, replenisher and fixer concentrates.

70. TERMINALS — Wade Electric Products Co. "Wade-Weld" terminals for automatic welding of terminals to wire are discussed and illustrated in 4-page booklet, specifications included.

71. RW, ARC WELDERS—Acro Welder Mfg. Co. 12-page bulletin No. 156 catalogs, with illustrations, line of special and standard resistance welders and arc welders.

72. WELDMENTS—Baldwin-Lima-Hamilton Corp. Bulletin 7001 discusses weldment facilities, with attention to fabrication of large custom-designed weldments such as pressure vessels, bridge structures.

73. WELDING FIXTURES—Lewis Welding & Engineering Corp. Folder (6960-LWE) describes, with application photographs, "Universal" automatic welding fixture.

74. PRODUCTION WELDING — Federal Machine & Welder Co. 4-page *Tips and Dies* (Vol. 2, No. 4) presents case history of use of welding press for fabrication of automobile frame assemblies.

75. HEAT TREATING—Selas Corp. of America. Feature of heat and fluid processing digest *High Gradient* (No. 24) is joining of metals by brazing.

76. FLAME-CUTTING—Vernon Tool Co., Ltd. Bulletin No. P-10 describes and illustrates flame-cutting machines.

77. PLUG CONNECTOR—Beryllium Corp. Technical bulletin No. 34 explains, with illustrations, plug connectors with beryllium copper sleeve spring.

78. STAINLESS TUBING, PIPE—The Babcock & Wilcox Co. Folder (TDC-154A)

(Continued on page 106)

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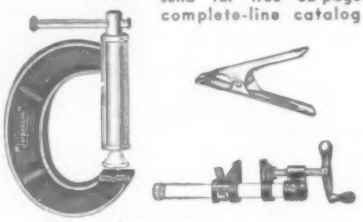

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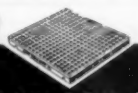
Welding  **Platens**
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presents maximum allowable stress values for ferrous pipe, in high temperature service tubing. Included are values at various temperatures for seamless and welded carbon, alloy stainless steels.

79. PASTE SEALER—Furane Plastics, Inc. Pocket-size bulletin EP-56-7 treats "Epocast" epoxy paste compounds for use in patching, filleting, as sealers.

80. PLATE CUTTING—Harris Service & Repair Corp. 4-page folder describes "Gascut" governor attachment for cutting torch for changeover to precision plate cutting.

81. PASTE SOLDER—Eutectic Welding Alloys Corp. Bulletin TIS 2406 describes new high silver content alloy, blended with special flux, in paste form for tinning, overlaying, joining, preplacement.

82. TOGGLE CLAMPS—Detroit Stamping Co. Full details on aluminum "De-Sta-Co" toggle clamps are given in bulletin 441-491.

83. HARDNESS TESTERS—Newage International, Inc. Descriptive literature treats construction and applications of portable hardness testers.

84. WELDMENT CORNERS — Conner Steel Products. 4-page circular 561 discusses prefabricated spherical metal corners for use on weldments.

ad literature

125. Airline Welding & Engineering—Data and samples on fusion butt welds.

126. Air Reduction Sales Co.—Catalog 9-13WE on rods and fluxes for joining both ferrous and non-ferrous metals.

127. Air Reduction Sales Co.—Catalog 1318-WE, "Airco Electrode Guide," to help you select the right electrode for your specific job.

128. Alloy Rods Co.—Information on welding T-1 steel with "Atom Arc T" electrodes.

129. All-State Welding Alloys Co., Inc.—Wall chart and "Buyers Guide" on alloys and fluxes for welding, brazing, soldering, tinning and cutting.

130. Aluminum Co. of America—For "Alcoa" welding products, write for list of distributors.

131. American Brass Co.—Details on braze welding with "Anaconda" rod.

132. American Manganese Steel Div.—Full details on the "550" automatic welder and the full line of "Amsco" hardfacing electrodes.

133. American Platinum Works, Inc.—A "Complete Guide to Selective Fluxing" for low-temperature silver brazing.

134. Ampco Metal, Inc.—Data on dissimilar metals easily joined by welds made with "Ampco-Trode 10" electrodes.

135. Anti-Borax Compound Co., Inc.—Sample and circular on cast iron No. 1 welding flux.

136. Atlas Welding Accessories Co.—Details on weld-cleaning tools and other accessories.

137. Belden Mfg. Co.—Information on welding wire.

138. Brennen, Bucci & Weber, Inc.—Color brochure containing complete specifications on "SP-100" spot welder.

139. Burdett Oxygen Co.—Catalog on how "Burdox" lowers cost of welding and cutting jobs.

140. Carborundum Co.—Information on aluminum oxide and silicon-carbide grinding wheels.

141. Chicago Eye Shield Co.—Details on "Cesco" goggles, lite-specs, fiber glass helmet, respirator hood, face shields, respirators, and other safety equipment.

142. Contour Marker Corp.—Information and instruction book on laying out pipe joints.

143. Contour Marker Corp.—Details on establishing and marking a point at any angle.

144. Coyne Cylinder Co.—Specification sheet and price list on acetylene cylinders.

145. Crescent Co., Inc.—Full information on "Carol Dynapower" welding cable for outstanding toughness and flexibility.

146. Cullen-Friestedt Co.—"C-F Positioner Catalog" on low-cost welding.

147. Detroit Testing Machine Co.—Information on fast, accurate, easy tensile testing.

148. Dockson Corp.—Write for distributor's name and complete catalog on welding and cutting equipment.

149. Drawalloy Corp.—Information on precision-drawn hardfacing and welding wire.

150. Engwald Corp.—Application data on welding-fume exhausters.

151. Erico Products, Inc.—Details on "Caddy Type B" electrode holders.

152. General Cable Corp.—Details on how aluminum welding cable makes your job easier.

153. General Electric Co.—Bulletin GEA-6242 on heavy-duty welders, plus a complete line of equipment, accessories, and electrodes.

154. General Electric Co.—Bulletin GEC-1305 on how 295-amp a-c welders provide big-welder benefits at a small-welder price.

155. General Electric Co.—Information on remanufactured ignitrons.

156. Goldsmith Bros. Smelting & Refining Co.—"GB Data Book" gives complete information on low-temperature silver-brazing.

157. H & M Pipe Beveling Machine Co.—Fully illustrated details on full line of pipe-cutting and beveling machines.

158. Handy & Harman—Bulletin 20 on how "Easy-Flo" low-temperature silver-brazing alloys makes fast, low-cost brazing setups practicable.

159. Harnischfeger Corp.—Information on "P & H" iron-powder, low-hydrogen electrodes.

160. Harrisburg Steel Co.—Prices and literature on gas cylinders.

161. Harris Calorific Co.—Information on automatic oxyacetylene torches.

162. Haynes Stellite Co.—Descriptive literature on complete line of welding rods.

163. Hobart Bros. Co.—Complete information on automatic welding.

164. Hobart Bros. Co.—Bulletin A-365-E on "Carbonair" cutting and gouging.

165. Hobart Bros. Co.—Information on standard welders.

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Welding Engineer
12 East Grand Avenue
Chicago 11, Ill.

Literature offered in ads

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166. Hobart Bros. Co.—Complete catalog on welding electrodes.

167. International Nickel Co., Inc.—"A Handy Guide to Welding Cast Irons," on successful cast-iron welding.

168. Jackson Products, Inc.—Information on series "70 Supergoggles."

169. K-G Equipment Co., Inc.—24-page catalog on cutting and welding torches.

170. Kaiser Aluminum & Chemical Corp.—Informative booklet, "New Advantages in Arc Welding Cable with Aluminum Welding Cable."

171. Kedman Co.—Information on welding helmets, face shields and accessories.

172. Lepel High Frequency Labs., Inc.—Catalog contains information on high-frequency induction heating units for brazing, annealing, hardening, soldering and melting.

173. Lewis Welding & Engr. Corp.—Details on the "Universal" automatic welding fixture.

174. Lincoln Electric Co.—Bulletin 1343 on "Idealarc" welder.

175. Linde Air Products Co.—Details on "Purox" blowpipes.

176. Mallory & Co., Inc., P. R.—"Resistance Welding Catalog" lists complete line of electrodes, holders, seam welding wheels, dies, forgings and castings.

177. Metal & Thermit Corp.—Details on how "M & T" controlled-arc power supply units can help you save time and cutting costs on many semi- and fully-automatic welding operations.

178. Metal Bond Mfg. Co.—Catalog on soldering and welding products.

179. Miller Electric Mfg. Co., Inc.—Details on "AEA-200-L" power plant.

180. Miller Electric Mfg. Co., Inc.—Literature on power plant/welder combination.

181. National Carbide Co.—Write for name and address of nearest supplier.

182. National Cylinder Gas Co.—Details on "Sureweld" electrodes.

183. National Welding Equipment Co.—Details on new compound pressure cylinder manifold.

184. Norris-Thermador Corp.—Data and specifications on all sizes of acetylene cylinders.

185. Page Steel & Wire Div.—Folder DH-402A on submerged arc and intert gas welding wire.

205. Page Steel & Wire Div.—Booklet DH-1277 on gas welding rods.

186. Phoenix Products Co.—Information on "Dry-Rod" electrode ovens.

187. Picker X-Ray Corp.—Data on industrial radiography (X-ray units for portable and mobile use, or stationary installation; Gamma sources, equipment and containers; and accessories).

188. Progressive Welder Sales Co.—Data on how advanced design of new press welder makes faster, easier, more economical spot or projection welding.

189. Rankin Mfg. Co.—Further details on hardfacing electrodes and rods.

190. Sellstrom Mfg. Co.—Details on face shields and respirators and brochure giving complete information and prices on No. 231 R fiber glass welding helmet.

191. Smith Corp., A. O.—Details on "C-O Manual" carbon-dioxide, hand-gun welding.

192. Smith Corp., A. O.—Data on how "SW-44" electrodes can help your welding operations in terms of time and effort economies.

193. Smith & Sons, Inc., G. W.—Data on how "Protect-O-Metal" spatter-proofing compounds make weld cleaning easier and improves your welds at the same time.

194. Square D Co.—Bulletin 8990 on new "Slope Control" unit.

195. Stulz-Sickles Co.—Complete "easy-to-do-it" bulletin on how to rebuild gyratory crushers with "Manganal" round applicator bars.

196. Sylvania Electric Products, Inc.—Technical information on four types of tungsten electrodes for inert-gas weldings.

197. Taylor-Winfield Corp.—Information on "Electro-Forging."

198. Tillman & Co., John—Catalog on weldors' gloves and garments.

199. Titanium Alloy Mfg. Div.—Information on "Ruflux" coatings for welding electrodes.

200. United States Steel Corp.—Complete information on how T-1 steel adds strength and durability.

201. United Wire & Supply Corp.—Information on "Phoson" alloys for brazing copper and brass.

202. Vickers Electric Div.—Illustrated brochure with complete information on "Controlarc" d-c welder.

203. Victor Equipment Co.—Descriptive Bulletin 353 on accuracy and speed with which "Duplicutter" handles cuts.

204. Worthington Corp.—Details on positioning equipment and nationwide sales and service.

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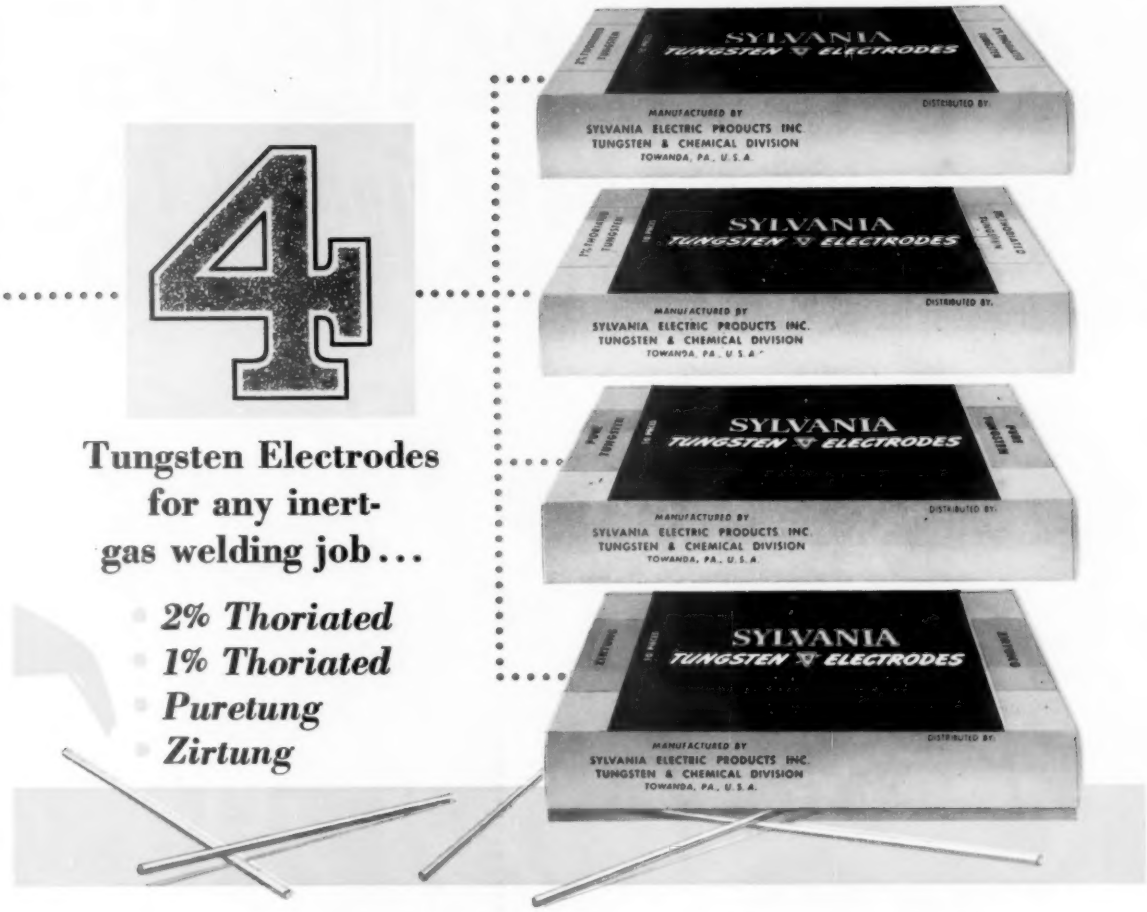

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